Communications
Canada

UNIVERSITY OF MONTREAL & CARLETON

C. KRISTEN (Montréal) & J.R. WESTON (

TITLE: Teleconferencing III: A Comp
of Group Performance Profiles

#37.

UNIVERSITY OF MONTREAL & CARLETON

C. KRISTEN (Montréal) & J.R. WESTON (Carleton)

TITLE: Teleconferencing III: A Comparison of Group Performance Profiles in Mediated and Face-to-face Interaction

CONTRACT: OSU4-0072

TELECONFERENCING: A COMPARISON OF GROUP PERFORMANCE PROFILES IN MEDIATED AND FACE-TO-FACE INTERACTION REPORT #3

J.R. Weston
Carleton University, Ottawa

C. Kristen
University of Montreal, Montreal

S. O'Connor
Carleton University, Ottawa

TELECONFERENCING III: A COMPARISON OF GROUP PERFORMANCE PROFILES IN MEDIATED AND FACE-TO-FACE INTERACTION

by: C. Kristen
J.R. Weston

(2)

TELECONFERENCING:

A COMPARISON OF GROUP PERFORMANCE PROFILES IN MEDIATED AND FACE-TO-FACE INTERACTION

REPORT #3

(1)

J. R. Weston
Carleton University, Ottawa

C. Kristen
University of Montreal, Montreal

S. O'Connor
Carleton University, Ottawa

Prepared for:

The Social Policy and Programs Branch
The Department of Communications
Ottawa, Canada

Contract OSU4-0072

April, 1975

PREFACE

This is the third in a series of reports presenting the results of a large-scale research project concerned with the description and explanation of the particularities of individual group behaviour in audio and audio-video teleconferencing.

The findings presented here, unlike most previous studies, are based upon a content/structural analysis of verbatum transcripts of teleconferencing sessions, rather than upon self-reporting questionnaire techniques. The analytic categories were structured to reflect a model of various components of group performance. Specifically brought into prominence are the areas of task accomplishment and interpersonal relationships. These are compared across audio and video conference media as well as the face-to-face conference situation.

Chapter I develops the taxonomy for investigating group performance. This taxonomy incorporates some of the major considerations of theorists working the area of nonmediated group performance and adds components that appear relevant to teleconferencing.

Chapter II briefly reviews the general methodology of the total research project and details the specific methods used in the content/structural analysis.

Chapter III presents the findings of the analysis of the performance taxonomy.

The findings are summarized in a section early in the report, and Chapter IV discusses the implications of the findings within the context of other available research.

The researchers wish to thank the Social Policy and Programs Branch, Department of Communications, The Government of Canada, for its support.

Also, we wish to acknowledge the contributions of Terry Murray, Carleton University, who acted as research assistant to the project from September, 1974 until March, 1975.

TABLE OF CONTENTS

The views and interpretations in the report are those of the researchers, and not necessarily those of the Department of Communications.

April, 1975

J.R.W.
C.K.
S.O.

LIST OF FIGURES

LIST OF TABLES

SUMMARY

This field experiment investigated the levels of task accomplishment and the nature of interpersonal relationships in audio-only teleconferencing, audio-video teleconferencing and face-to-face conferences. Analyses were performed on the data collected from more than eleven hours of speaker identified verbatum transcripts of the conference sessions. A total of 18 sessions, six in each communication condition and each lasting an average of about 40 minutes, were video taped and the transcripts prepared from the video tapes.

Participants in the conferences were students who had been enrolled for five months in a Communication course at Carleton University who were randomly assigned to the conference modes. The task required that the groups discuss all of the aspects of the course and make recommendations for changes and improvements, together with their suggestions on how the recommendations should be implemented.

The following is a summary of the major findings of the content/structural analyses of the sessions. These are presented more fully in Chapter III and their implications discussed in Chapter IV.

COMPARISONS OF GENERAL COMMUNICATION BEHAVIOURS

- Fewer words were spoken in the audio sessions than in the video or face-to-face modes--about 10% less. Audio was characterized by slightly longer pauses between speakers and more periods where no one spoke.
- Speakers in audio tended to 'give up the floor' more quickly than in the other modes i.e., the individual utterances were shorter. The differences were quite large in that audio utterances on the average were about 60% as long as those in face-to-face and about 80% as long as those in video--people spoke more often in audio but in shorter bursts.
- In the face-to-face condition, people were much more likely to address their remarks to the whole group than to another individual or subgroup. In the teleconferences, remarks were more often directed to other individuals or subgroups. The likelihood that remarks would be directed to a member or members of the 'other' node was, with the exception of emotionally supportive remarks , much more pronounced in audio than in video.
- In terms of these general characteristics, video fell between audio and face-to-face but was closer to face-to-face.

TASK PERFORMANCE

- The audio groups spent less time in all forms of specific task-related discussion (about 10% less) than either video or face-to-face. However, they spent more time in generally developing and maintaining task and group organization. Task and group maintenance in the video conferences while more than in face-to-face, was less than in audio.

- The audio group devoted about three times as much discussion to the constraints of the technological system as did video, but neither mode spent much time verbalizing any concerns they might have had.

- The audio groups spent less time developing and exploring the various dimensions of the task situation than the other two conference conditions. They also spent proportionately more time requesting others to contribute information than did video or face-to-face, and proportionately less time providing task information. Also, compared with the video conferences, a disproportionate amount of the requests were made of the other node as opposed to one's own node or the whole group.

- Discussion preceding a recommendation was less complex in audio than in video or face-to-face. Discussions had a greater tendency to treat the dimensions of the task one-at-a-time rather than in combination, with the result that the adjustment in one factor less often considered the implications this held for other dimensions. This may be related to the fact that audio speakers spoke in relatively short bursts which would make it more difficult to express more complex relationships. Discussion complexity was about equal in video and face-to-face.

- The stated purpose of the conferences was to make recommendations. Both the video and face-to-face groups made nearly twice as many recommendations as did the audio groups. The audio groups had much less success in translating task discussion into recommendations. Not only were there absolutely fewer recommendations made in audio, a disproportionate number of these concerned only a single dimension of the problem. The number and complexity of the recommendations in audio compared quite unfavourably with the other two modes.

- Video groups made somewhat more unidimensional recommendations than face-to-face but the number of multidimensional recommendations was the same in the two modes.

- In addition to making fewer and less complex recommendations, the audio groups also refined and adjusted their recommendations considerably less than did the other two modes.

INTERPERSONAL RELATIONSHIPS

- The audio groups devoted less of their communication to simple agreement than did either video or face-to-face--about half as much overall agreement as in face-to-face and about three-quarters as much as in video. However, the audio groups did tend to agree with members of the mediated node proportionately more than did video group members. This is in contrast to the pattern of high intensity statements of emotional support, where the likelihood that the support was for someone in one's own node was higher in audio.

- Although, in post session questionnaires, audio group members reported more uncertainty about a variety of aspects of the conference situation than did those from the other conference modes, they expressed feelings of uncertainty during the sessions much less frequently. This suggests that the inability or unwillingness to express uncertainties in audio, particularly to the unseen members of the other node, left the uncertainties unresolved in these groups. Of the three modes, those in the face-to-face condition were most willing to ask for help, understanding or interpretation.

- Those in the audio condition regularly sought confirmation that an individual or group was still psychologically 'present'. This rarely occurred in either video or face-to-face. The audio requests for confirmation were almost all addressed to the mediated node.

- The video mode members were most willing to make statements of disagreement with others and the audio members the least willing. Video members were just as likely to disagree with members of their own node as with members of the other node, but audio group members disagreed with someone from their own node only infrequently.

- There was more overall high intensity disintegrative or hostile communication in audio than in the other conference conditions, and by far the least in video. In audio, almost all of the antagonistic remarks were directed

at the other node, but in video, the remarks were as likely to be directed at a member of one's own node as to a member of the other node.

- The audio group members also depreciated or deflated the importance of the task about three times as often as did those in the other two conference types.
- An index of group integration, based upon "we/you" distinctions, revealed that the video groups used "we", meaning the whole group, much more often than did the audio groups, and either "we" or "you", meaning ' our node' and 'your node' much less often.
- In general then, compared with video and face-to-face, the audio only medium generated a task environment that was much less productive and more hostile. The television medium was slightly more productive and considerably less hostile than the face-to-face medium.

CHAPTER I

INTRODUCTION

The investigation of teleconferencing systems must, in the final analysis, elaborate the utility of these systems for people to conduct their affairs at satisfying and productive levels. Considerations of such things as cost and physical convenience of teleconferencing facilities must be placed squarely within a performance perspective, assuming a position of importance only from within **this** perspective.

This study compares audio, video and face-to-face conferencing on a variety of aspects of group performance. It is unlike previous studies of teleconferencing behaviour, and an earlier report on the present research program, that have depended upon questionnaire data from participants for evidence.[1] The evidential base of this investigation results from an ongoing content/structural analysis of the verbal communication behaviour during conferences on the three conference modes.

Unlike questionnaire data that require conference members to make subjective judgements on "what went on", an ongoing content/structural analysis provides a non-subjective account of the group proceedings--non-subjective in the sense that the salient communication behaviours are coded and analyzed by someone other than the conference participants themselves. Although subjective and non-subjective analyses should complement each other, there are some distinct advantages in employing non-subjective data-gathering procedures, despite the fact that these techniques are tedious and time consuming.

First, an ongoing analysis of the interaction can provide transaction-by-transaction processual information rather than global measures of the conference "in general". Second, the procedure analyzes events as they happen rather than relying on recall. Third, the technique does not require

participants to structure their opinions along dimensions that they sometimes may be either unable or unwilling to conceptualize. Fourth, and perhaps most importantly, the content/structure analysis yields a much larger quantity of precise information about the functioning of the group than could ever be possible from post-session questionnaires. Quantity and precision of information notwithstanding, however, the utility of content/structural analysis is entirely dependent upon the power of the organizing framework to tap the relevant aspects of the phenomenon--in this case, relevant aspects of group performance.

The determination of criteria for evaluating group performance presents a problem that has long intrigued and frustrated social scientists and others. Accordingly, it is a problem that has received an abundance of attention, particularly in the past quarter century, in attempts to develop theories of human groups.[2] Needless to say, the research and theoretical consideration have been devoted almost entirely to groups interacting in real space and time. The development of communication technologies for group interaction has underlined the need for the development of group performance criteria and given it a sense of urgency that was previously lacking. Not only are teleconferencing systems expensive to install on any scale, but the consequences of decisions that are made and actions that are taken in teleconference meetings could, in time, if such conferencing systems become commonplace, become critical for all levels of the social system. For these reasons, it is imperative that performance criteria be clearly developed and thoroughly investigated in experimental teleconferencing facilities.

Without attempting a thorough review of group performance criteria that have been devised, almost all of the research to date can be categorized in one of two ways based upon the nature of the problem or task material used. On the one hand is highly controlled research using problems or tasks for which the 'correct' solutions are known in advance (by the researchers).[3] These are closed problems and have the advantage of

permitting fairly unequivocal measurement of such performance criteria as 'accuracy of solution', 'time to solution', and a variety of 'efficiency' concerns. (Much of this research stemmed from an interest in comparing individual and group performance, which is not central to the questions posed by teleconferencing.) While this tradition has raised some important questions and provided a variety of answers, the tasks that have been used do not provide information that can be easily generalized to "real life" situations. For example, very rarely do "real" groups discuss problems for which some other identifiable group of people already has the solution; 'accuracy' is rarely a consideration in evaluating decisions; 'quality' of decisions is not usually immediately known; and, 'solution time', by itself, can be very misleading, in that solutions or decisions that are arrived at quickly may be simple and disfunctional for complex problems.

A recognition of the limitations of closed purely logical tasks resulted in a research stream that came to be known as "brainstorming". Typically, this line of research employed open complex tasks where group performance was measured in terms of the quantity of non-overlapping ideas or alternatives that were generated.[4] While these task situations provide some information about the creativity of a group to map a task environment, the "brainstorming" studies have, in effect, equated quantity with quality. Moreover, they neglect entirely the critical questions of how a group sifts and selects from alternatives and the group processes involved. Taken together, the two major emphases that have attempted to come to terms with group performance have been overly concerned with output at the expense of developing criteria to evaluate the performance of a group while it is functioning as a group. The group itself has by and large remained a black box into which problems are fed and from which decisions, actions or ideas emerge.

Behavioural research on teleconferencing, if it is to provide information for systems designers and those charged with the responsibility of deciding whether or not teleconferencing is a practical alternative for their institutional needs, must begin to make the black box more transparent, must begin to describe actual teleconferencing behaviours and understand their relationships to the products of the conference group.

AN ORGANIZING FRAMEWORK FOR GROUP PERFORMANCE

The interplay between a group and its task environment, from which performance is determined, should be assumed to be a complex phenomenon that must be approached from a variety of standpoints and a number of levels of elaboration. In the following several pages a framework is developed for analyzing productivity in decision-making groups. Those familiar with advances in group performance theories will recognize the contributions of such theorists as Roby and Lanzetta,[5] Schroeder, Driver and Streufert,[6] Berlyne,[7] and Bales;[8] however, since each has approached the problem from his own theoretic preoccupations, the integration and extension of these several models required liberal interpretation, reformulation, omission, and the addition of constructs considered important to mediated group performance.

Given the existing state of knowledge concerning mediated group performance, we are arguing for an organizing framework of the middle range. Since mediated group performance has not as yet been systematically analyzed, we feel that a middle range taxonomy will, at the present time, provide the maximum level of useful performance information. By "middle range" we mean, on the one hand, a classification system with greater descriptive and predictive range, and greater explanatory power, than is possible from after-the-fact questionnaires that require participants to rate group performance on a series of scales. (These are typically semantic differential scales dealing with such global evaluations as "bargaining", "negotiation", "information exchange", "brainstorming", "problem solving discussion", and the like.[9]) While this procedure is easily applied and yields information that is clearly of value, its descriptive and explanatory limitations are equally obvious.

On the other hand, the state of performance theories militates against attempting an atomistic mathematical model of the process. Those that have been attempted have necessarily been limited to diadic communication investigating a small number of parameters that can take a manageable number of defined and measured values.[10]

In the taxonomy that follows, a variety of aspects of group performance are considered. The degree of specificity accorded each consideration is, in large measure, determined by the centrality of the factor to task accomplishment.

I CONTENT/STRUCTURE SPACE

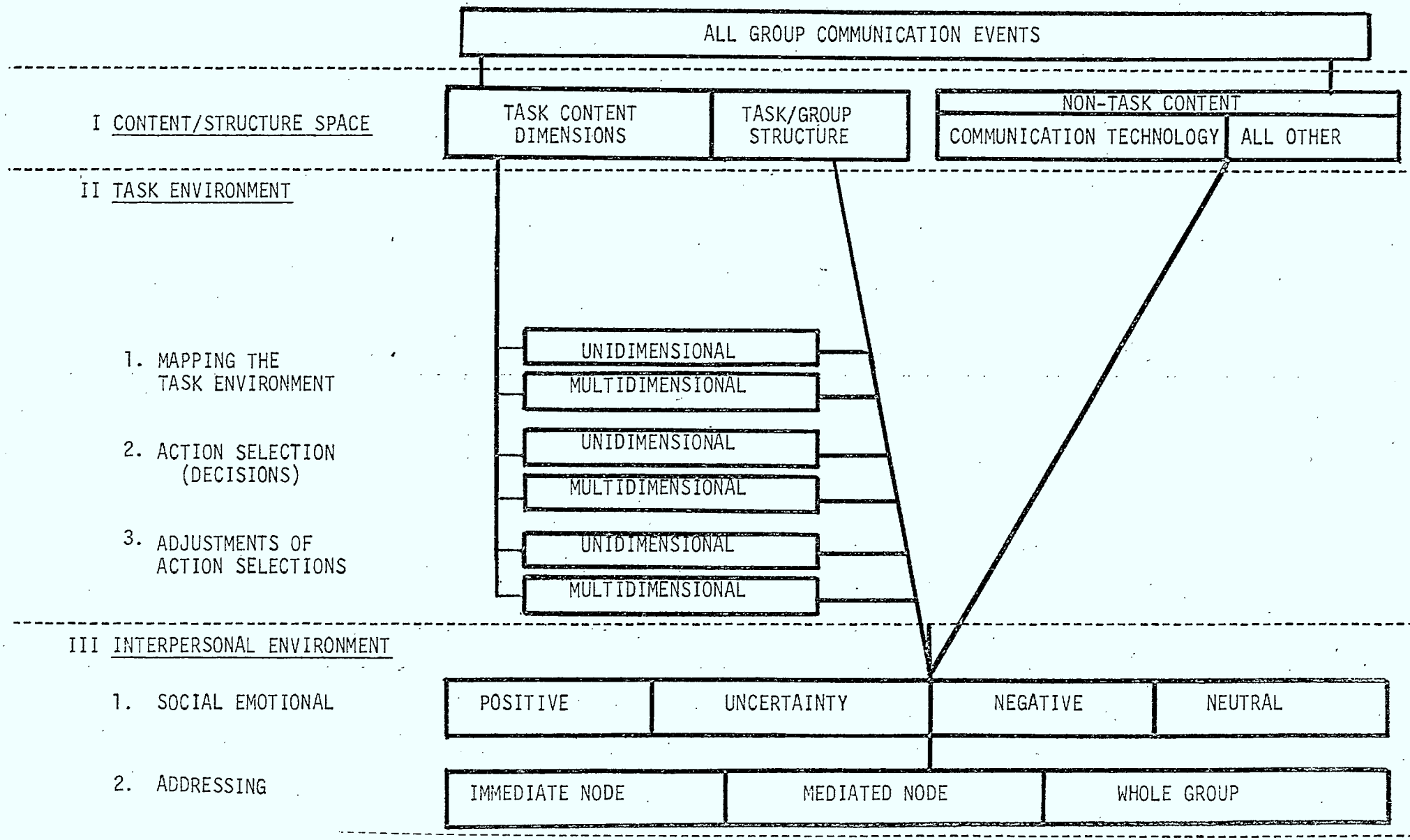
It is highly unlikely that any group will devote all of its discussion to the task at hand. The factors that determine the ratio of task to non-task information that is actually exchanged are many and varied. While nothing would be served by attempting to catalogue the factors here, they include such things as the importance of the meeting, the difficulty of the task, the salience of other events, intragroup familiarity, the social and psychological make-up of the individuals, and possibly, the technological aspects of the communication environment. Although a certain amount of nontask communication appears to be necessary for a group to function at an optimal level, it can be argued that in general and within some limits, as the task to nontask proportion increases, the potential of a group for obtaining its objectives also increases.[11]

Task Content Dimensions The dimensions of any task are the esoteric factors that either are, or could be, relevant to the action selections made by a group. The dimensions are either externally imposed upon the group, internally generated, or usually some combination of the two. The interplay between the group and the perceived dimension of the task environment determines the actual task environment that the group is able to map. Since any mapped task environment is unique for a particular group engaged in a particular task, this component of the taxonomy is of little theoretical interest; however, it must be carefully examined and specified as it is essential for the analysis of the critical aspects of group performance.[12]

Task Structure All of the task space is not defined by communication about specific content dimensions of the task. Information is also exchanged about the way the group will structure itself. This type of communication

FIGURE 1

A TAXONOMY FOR ANALYZING COMMUNICATION PERFORMANCE
IN FACE-TO-FACE AND MEDIATED DECISION MAKING GROUPS



involves such things as group norms and procedures, formal and informal task role relationships between the individuals and noncontent specific communication about task procedures. Thus, task structuring communication is all task-related communication that does not directly relate to one or more specific content dimensions of the task.

Non-Task Content Dimensions The remaining component of the communication content space is all exchanges that are not manifestly related to either the task structuring of the group or the specific content dimensions of the task. The key word here is "manifestly". As previously mentioned, it can be argued that the non-task content is necessary and desirable and bears latent relationships to task-related performance. However, nontask exchanges do not bear directly on task action selections of the group and, beyond some undefined optimum level of occurance, are counterproductive.

The degree of specificity in mapping the nontask dimensions of the communication space is arbitrary. The map can be either very detailed or, as in the present study, not very detailed at all. However, because the study is a comparative analysis of different mediated modes of group communication, group discussion of the communication system was separated from all other non-task related communication.

II TASK ENVIRONMENT

Level I of the taxonomy, as described above, is a system of classifying group communication events as either (a) task related--content dimensions or structural procedures or (b) nontask content dimensions. The analysis of group task performance, however, requires that the nature of the task content information be specified. To determine task accomplishment it is necessary to distinguish between two kinds of information that bear on action selections; that describing or mapping the task environment which serves to circumscribe the group's action selections, and the action selections themselves and subsequent adjustments to these action selections.

Task Environment Mapping Any group that is convened for the purpose of making decisions or taking other actions maps the dimensions of the problem. This type of information exchange, usually referred to as "discussing the problem or situation", determines the informational pool from which action selections can be drawn. Dimensions, and the states associated with any particular dimension, that are not mapped as part of the task environment are usually out of group awareness and not included or accounted for in the action selections made by the group.

With a high degree of information about the 'objective' parameters of a task environment, including its range of separable dimensions, the states the dimensions can take, and the nature of their interrelationships, as well as the informational states of the group members on each of these, it might be possible to develop a paradigm of task environment mapping. In practice, the mapping largely occurs in an ad hoc fashion. The dimensions of the task are discussed singly or in combination through personal experiences, opinion and expectations, all tempered by the individual backgrounds and values of the group members. While the mapping process is largely opaque, it is this 'discussion' process that sets the action selections of the group.

Action Selection Action selection is a generic term for the array of possible objectives of a group. These include decision making, problem solving, taking some other action, or making recommendations for actions to be taken by some other body. Of all of the behaviours and consequences that can fairly be described as group performance, action selection is the specified raison d'etre of the group. It is usually this component of group performance that is being referred to when such questions as "What did you accomplish?" or "How productive was the meeting?" are raised. The criteria for evaluating action selections must always be linked to the task at hand and no single criterion generalizes to all tasks. The nature of any such evaluations will depend upon such things as the action potential of the group, theirs and others' expectations, the complexity of the problem, and the availability of objective measures of the quality of the action selections.

Adjustment of Action Selection The remaining component of task environment communication involves information that adjusts or refines action selections advanced by the group. While this could be considered a subset of task environment mapping, it deserves to be treated separately. Although all task dimensions that are mapped are not necessarily accounted for in action selections, all dimensions of the task that are introduced as adjustments to action selections must bear upon these selections--the major evaluative component of group performance.

Integration of Task Content Dimensions In addition to simply classifying task related communication as either mapping, action selection or action selection reformulation, a more powerful description of group performance and a basis for evaluating group performance are obtained by determing the integrative complexity of the information that is processed and transmitted within the group.[13] The integrative complexity of the communication task space that emerges in a group can be viewed as a complex combination of the number of dimensions of the problem or situation that are generated, the variable states that are isolated on these dimensions, and the 'rules' that are developed for combining dimensions and states.

Communication structures of low integrative complexity are, in general, characterized by few dimensions and dimensional states and few rules for combining dimensional states across dimensions. The dimensions of the problem tend to be considered one at a time in a compartmentalized manner rather than taking other dimensions into account concurrently. Higher levels of integrative complexity will tend to consider more dimensional states conjointly.

Mapping a task environment of low integrative complexity results in action selections and reformulations that are correspondingly low in integrative complexity i.e., if a problem or situation is seen as simple by the group, their decisions or solutions will tend also to be relatively simple. It follows, that as the task environment that is generated becomes increasingly complex, the potential for integratively more complex and powerful action selections also increases. In the absence of absolute measures for determining

'objective' quality of a group's action selections, a useful measure of group performance can be obtained by determining the integrative complexity of the action selections.

There are, of course, potentially counterproductive consequences associated with mapping either simple or complex task environments. Simple task mapping can provide such a limited array of dimensions as to inhibit the process of integration, with the result that action selections are overly simplistic and/or the group becomes bored (information lack stress). On the other hand, the task can be mapped with such a number and/or diversity of dimensions that action selection is inhibited (information excess stress).[14] The optimum level of complexity that is mapped is one that falls between these two extremes i.e., one that avoids either boredom or excessive frustration. The group will function most successfully when the level of complexity with which the task environment is mapped matches the information processing capabilities of the group to make action selections.[15]

III INTERPERSONAL ENVIRONMENT

The previously described classifications were concerned with the content of the communication, without reference to its relational aspects. Every communication exchange has both content and relational components and the latter defines the former by providing the context in which the content should be interpreted. While any communication event is about some 'thing', it is also about the relationships that exist among the communicants. This metacommunication says such things as "This is the way I see you", "This is the way I see myself", and "This is the way I see you seeing me".[16]

Not only are the relational aspects of communication performance interesting in their own right, since relationships that develop within a particular group meeting carry over to other areas of activity within an organization, but also that the level of task accomplishment of the group is affected by the interpersonal atmosphere that prevails.[17] This is both self evident and clearly documented in the small group literature.

Many schemes have been devised for analyzing interpersonal relationships in groups that are more elaborate than the one to be presented here. The present scheme most closely resembles the social emotional catagories of Bales but additional catagories are included to bring into prominence the peculiarities of mediated group interaction.[18]

Positive Social Emotional Any communication event, whether it is specifically task related or not, may serve the purpose of making the group more cohesive. These may range from simple agreement (indication that the person accepts, understands, concurs or in some other way suggests satisfaction with the group or someone within the group), through emphatic expression of solidarity (communication intended to sooth hostility, raise individual or group status, giving help or verbally rewarding the group or a group member beyond simple agreement).[19]

Negative Social Emotional Other communication tends to have a disintegrating effect on a group and these remarks can be scaled on a noxity continuum. At the lower or least noxious end, is communication that transmits disagreement, reservation and doubts. As Bales has properly pointed out, a balanced and productive group must have varying degrees of this type of communication if alternatives are to be weighed and sifted. Further along the continuum are communications that are stronger than disapproval in that they signify antagonism. Such expressions usually employ language that connotes hostility, is intended to deflate the status of another person or group of people, or is an emotional defence of the speaker's opinions or position. Extremely noxious communication often affects all group members negatively and can result in acute embarrassment and temporary or more permanent psychological or even physical withdrawal from the group.

Social Emotional Uncertainty In addition to either positive or negative social emotional communication, some communication in groups focuses on uncertainty and confusion within the group. Attempts to elicit agreement, cooperation, understanding or confirmation are neither positive nor negative in themselves, since this type of communication can elicit either supportive or non-supportive responses.[20]

Social Emotional Neutrality It is theoretically inconsistent with our earlier statement, that all communication events have a relational component,

to now define any social emotional state as "neutral". However, many communications events have manifestly little in the way of social emotional overtones and certainly provide few cues that would permit any theoretical concensus. To attempt to develop a more precise scheme at this time would likely prompt a debate that could obscure our more important considerations of group performance. Therefore, admitting a lack of elegance, all communication events that are not manifestly supportive, non-supportive, or that reflect uncertainty, are defined as 'neutral'.

Addressing The concept of addressing, "who's talking to whom", is the vehicle for linking social emotional information about the relationships between group members to task accomplishment. Without attempting to be precise at this time, few if any would argue with the notion that the social emotional atmospheres that exists between group members or sub-groups are factors that influence task accomplishments.

While this is assumed to be true of all decision-making groups, it appears to be of even greater importance in understanding the performance of groups linked by communication technologies.[21] Many schemes could be devised for catagorizing addressing patterns in groups, but the physical realities of teleconferencing suggest that particular attention be paid to social emotional information that is primarily routed to (1) all group members simultaneously, (2) a member or members of the immediate group, or (3) a member or members of the mediated group. The analysis of the addressing or information routing patterns not only provides measures of the interpersonal environments that develop but also specifies the communication patterns that determine the task environment that is mapped.

INTERRELATIONSHIPS BETWEEN TAXONOMY COMPONENTS

The preceding description of components in the taxonomy captures, we feel, many of the salient factors of group performance. Ideally we would want to model the processes in such a way as to indicate the nature of the relationships between the various components. This remains, however, a vexing problem and it would be wholly gratuitous to presume, for instance, that the integrative complexity of a group's action selections is inversely

related to the amount and degree of hostility generated in the group.

We will not attempt the a priori development of a series of hypotheses or propositions that either related the components of the taxonomy or make predictions about the efficacy of the various communication modes under investigation; although, from prior evidence it would be possible to make some guesses with a fair degree of confidence. Rather, having raised some considerations to a level of prominence, we prefer to analyze these and simply report our findings. While causal linkages between components and modes should be suggested by the analyses, at the very least we will be able to say that these attributes of group performance tend to coexist at similar or differing levels, for various communication modes.

Footnotes:

1. The writers know of no teleconferencing studies dealing with group interaction that have not relied either upon self-reported questionnaires or personal interviews with system users.

   An earlier report on another phase of this study by the writers was based upon analyses of self-reported instruments:

   Weston, J.R. and Kristen, C., Teleconferencing: A Comparison of Attitudes, Uncertainty and Interpersonal Atmospheres in Mediated and Face-to-Face Group Interaction, Report #1, Social Policy and Programs Branch, Department of Communication, Ottawa, Canada, 1973.

2. c.f. Barry E. Collins and Harold Guetzkow, A Social Psychology of Group Processes for Decision-Making, Wiley, New York, 1970.
   Joseph Berger et. al., Types of Formalization in Small-Group Research, Houghton Mifflin, Boston, 1962.
   Joseph E. McGrath, Small Group Research: A Asynthesis and Critique of the Field, Holt, Rinehart and Winston, New York, 1966.

3. A variety of studies of this type are documented and reported in the monographs mentioned in the second footnote.

4. c.f. M.D. Dunnette et. al. "The effectiveness of group participation on brainstorming effectiveness for two industrial samples", Journal of Applied Psychology, 1963, 47, 30-37 or T.J. Bouchard, Jr. and M. Hare, "Size, performance and potential in brainstorming groups", Journal of Applied Psychology, 1970, 54, 51-55.

5. T.B. Roby and J.T. Lanzetta, "Work group structures, communications and group performance", Sociometry, 1956, 19, 105-113.

   T.B. Roby, Small Group Performance, Rand McNally, Chicago, 1968.

6. H.M. Schroeder, M.J. Driver and S. Streufert, Human Information Processing, Holt, Rinehart and Winston, New York, 1967.

7. D.E. Berlyne, Conflict, Arousal and Curiosity, McGraw-Hill, New York, 1960.

8. R.F. Bales, Interaction Process Analysis, Addison-Wesley, Cambridge, 1951.

9. c.f. Communications Studies Group, Joint Unit of Planning Research, Interim Report, London: University College, 1971 or B.C. Tel, An Experiment in Conference T.V., Vancouver, 1974.

10. A number of studies of this type are reported in Schroeder, Driver and Streufert, Human Information Processing, Holt, Rinehart and Winston, New York, 1967.

11. For a discussion of balanced social emotional communication see C. Heinicke and R.F. Bales, "Developmental trends in the structure of small groups", Sociometry, Vol. XVI, 1953, 7-38.

12. Some attempts have been made to define the specific properties of group task. These include:

    J. Altman, "Aspects of the criterion problem in small group research. I Behavioural domain to be studied", Acta Psychol. 1966a, 25, 101-131.

    L.S. Christie, "Task types and requirements for organization", in J.R. McClosky and J.M. Coppinger (Eds.), Operations Research for Management, Vol. 2, The Johns Hopkins Press, Baltimore, 1956.

13. Schroeder, Driver and Streufert consider integrative complexity as the key concept in coming to terms with information processing at any level of analysis. For an elaborate and compelling discussion of integrative complexity see their monograph Human Information Processing.

14. A more complete discussion of information lack/excess stress is presented in James G. Miller, "Living systems: basic concepts; structure and process; cross-level hypotheses, Behavioural Science, 1965, 10, 193-411.

15. A much fuller discussion that is pertinent to the relationship between the mapped complexity of the task environment and the ability of a group to process the information can be found in Schroeder, Driver, and Streufert, Human Information Processing, particularly in Chapter 3, "The U curve hypothesis relating environmental complexity and level of human information processing".

16. The interdependencies between content and relational components of communication are thoroughly explored in P. Watzlawick, J.H. Beavin and D.D. Jackson, Pragmatics of Human Communication, Norton, New York, 1967.

17. c.f. the monographs referenced in footnote 2.

18. R.F. Bales, Interaction Process Analysis, Addison-Wesley, Cambridge, 1951.

19. For a complete description of both positive and negative social emotional categories see R.F. Bales, Interaction Process Analysis.

20. The scheme being presented departs from that of Bales in two major ways. First, Bales conceives of a communication event as being either task oriented or social emotional. We argue that any event is potentially both. Secondly, Bales does not consider social emotional uncertainty; however, there is, in our observation, a class of communication behaviour that is clearly social emotional that conveys uncertainty about some aspect of the group environment.

21. It is commonly observed in teleconferencing sessions that groups at one node refer to themselves as "we" and to those at the distant node as "you". That this serves more than simply identifying the obvious physical barrier between certain group members has received some support from the evidence presented in our Report #1 that investigated internode atmosphere.

CHAPTER II

METHOD

The raw data upon which the results presented in this report are based, was collected by split-screen video tape recordings of 18 conference group sessions, each lasting up to 45 minutes. The 18 conference sessions are a subset of 47 sessions held on three conference modes.

Since the present data is a part of the larger experiment, the selection of subjects and their organizational setting, the conference modes, the task, experimental design and procedures are identical to those reported in full in Report #1.[1] A brief description of the general methodology of the larger study will be presented here, but the reader is referred to the initial report for the complete details.

GENERAL METHODOLOGY

Conference modes The face-to-face facility was a small well-lighted seminar room where the six group members sat across a conference table from each other, with three people on each side. There was a writing pad and pencil at each position and centered behind each side of the table was a fixed TV camera linked to a VTR camera that recorded their interaction on a horizontally split-screen located in another room.

The video conference facility consisted of two media interactive rooms (nodes) located in different parts of the same building and connected through a patch panel providing for video recordings with a 5 MHZ bandwidth. Each node accommodated three members of the group who sat side-by-side at a five foot conference table, four feet from a bank of four television monitors. One monitor provided a head and shoulders view of the three participants at the other node; a second monitor a view of themselves that the people at the other node were receiving; the other two monitors provided for any incoming or outgoing graphic material that the two nodes wished to exchange. Each participant was provided with a writing pad and dark felt pen and visual material could be placed on a shared register easily reached by any of the three people. A graphics camera was mounted above the table, locked in position, and focused on the 4½ by 6 inch field of view register. The

facility was entirely 'hands-off' and no special information was required to familiarize conferees with its use. (Figure 2).

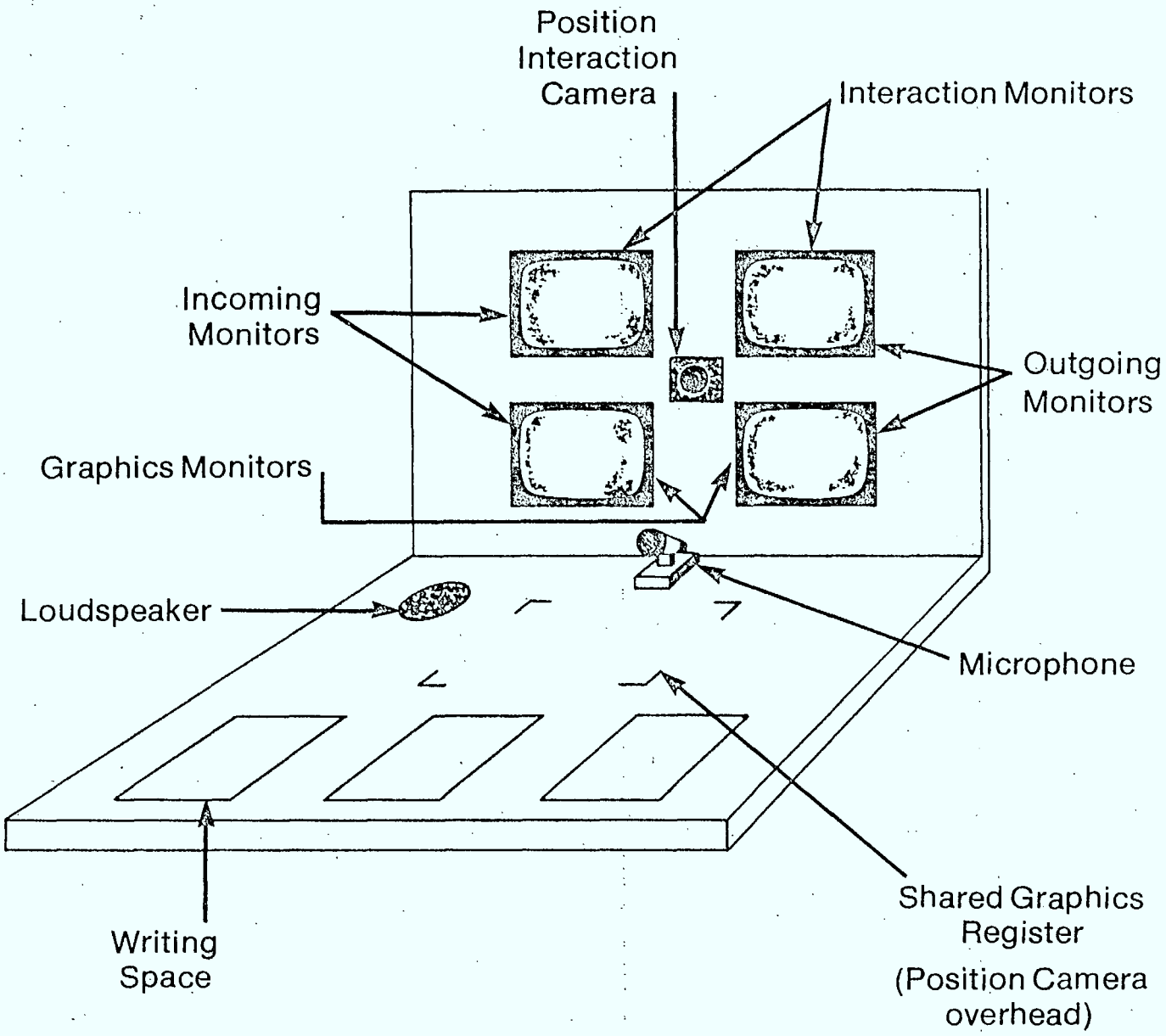
The audio conference used the same facilities as did the video conference except that the two interactive monitors were panelled over. The graphics capability was retained. (Figure 3).

Conference sessions A conference consisted of three sessions of up to 45 minutes held on three consecutive weeks at the same time period. The same six people, except for replacement for attrition in the second and third sessions, met together for the three weeks using the same conference facility and discussing the same problem.

Subjects and Assignment to Conference Groups All subjects were Carleton University students in a Human Communication course with an enrollment of 650. The course is organized so that students attend the same small 20 person tutorial group for two hours a week to work on a variety of projects. At the time that the experimental sessions were held, students had been working with other members of their tutorial group for half the university year.

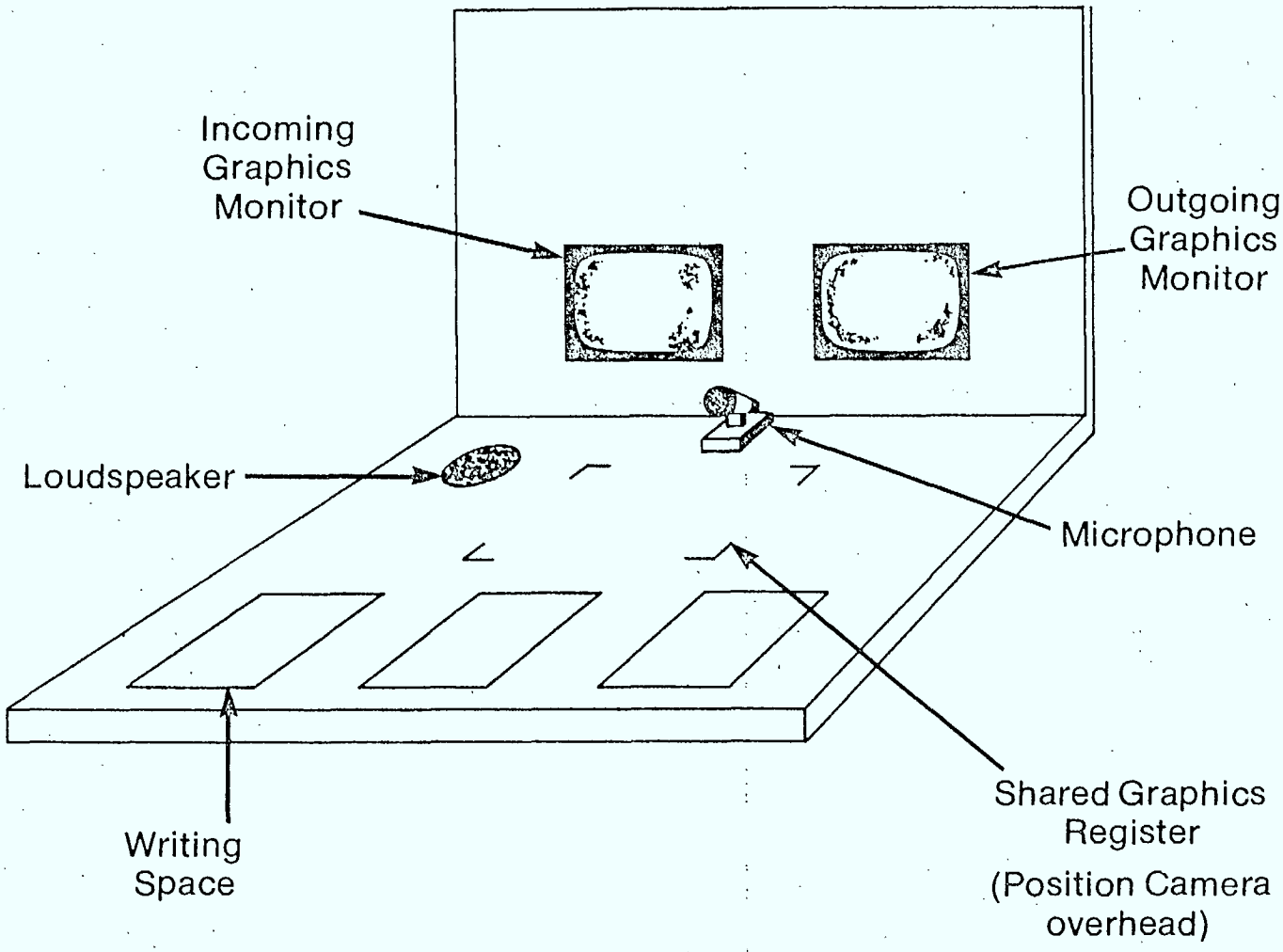
Subjects did not volunteer for the conference, but rather, tutorial groups were selected at random and all members of a selected tutorial group attend conference sessions as part of the formal course requirements. Subjects from a tutorial group were assigned randomly, three at a time, to one of the communication conference modes, in such a way that the two sets of three making up any conference group were people from two different tutorial groups. In the two technological modes, the three from one tutorial were at one node and three from the other tutorial group were at the other node.

The Conference Task All conferences on all communication modes engaged in the same task for all three sessions (weeks). Each group was given the same written instructions requiring them to discuss all of the substantive and procedural aspects of their course in Human Communication and to make recommendations for changes and improvements that they felt should be made, together with their recommendations on how such changes should be implemented.



Video Conference Mode
(one of two Nodes)

Figure 2



Audio Conference Mode
(one of two Nodes)

Figure 3

This task was selected after considering a wide variety of alternatives because it was felt that the topic was credible for the participants, potentially complex, would permit communication behaviours that would generalize to other groups and tasks, and because the task was consistent with the objectives of the course and the prevailing social climate within the University.

At the end of each session, conferees were individually required to complete a questionnaire that asked them to (a) outline what they felt were the group's recommendations, and (b) respond to a series of questions about the conference and the people in the conference. The questionnaire information however, is not the data base for this report.

The preceding briefly outlined the general methods used in the study. We now turn to the specific methodological requirements of the content/structural analysis of the actual interactions in the three conference modes.

SPECIFIC METHODOLOGY

Since all of the conference sessions were recorded on video tape, more than 30 hours of conference time was potentially available for analysis. A detailed analysis of the total time was not feasible and the decision was made to transcribe and code two complete conferences from each communication mode. This represented 18 sessions (six from each mode and six from each of the three weeks) or slightly more than 11 hours of conference time.[2] The logic of the performance analysis required that complete conferences, rather than random segments from all conference sessions, be coded. Coding communication behaviours from random sections of all 47 sessions would have provided a more stable estimate of some of the communication behaviours and any effects of personal communication attributes of individual group members would have been reduced. However, the major consideration of group task accomplishment could not have been reliably determined from samplings of the interaction.

Ideally, the two conferences from each mode would have been selected at random, but this would have created a number of problems, since all sessions did not maintain six members, audio loss occurred on the recording of parts of some due to mechanical difficulties, and for two sessions portions of the video band of the tapes were of such poor quality that speaker identification was impossible. The selection of the two conferences from each mode was not in any way influenced by conference proceedings but rather selections were made upon (1) each of the three sessions within a conference maintaining a group size of six, and (2) the audio and video quality of the recording remaining uniformly high across all three sessions.

Preparation of Transcripts One expert typist prepared all 18 transcripts. The transcripts were verbatim accounts of the proceedings, in the sequence in which they occurred in the conference, and speakers were identified numerically by the position they occupied on the tape. It should be noted here that the transcriptions of the verbal utterances of six people, including their nonfluencies, from a video taped record is a long and tedious task. The faithful recording of the 18 sessions took about 10 hours each. Samples of the transcripts are provided in Appendix A.

Selection and Training of Coders Six coders were hired to code the conference interactions from the typed transcripts. All were, or had been, tutorial leaders in the program being discussed in the conferences so were familiar with any task-related jargon used by the conferees. This was necessary for properly identifying the various dimensions of the task environment.

Since conferees were identified only by tape position, the coders had no way of personally identifying any of the speakers. Neither did they know either the week or mode they were coding, except from what they might infer from the verbal content of the transcript as they coded. Moreover, the coders had no information about the previous questionnaire analysis and were naive as to the purpose of the experiment. Each coder coded three transcripts and these were assigned so that no coder coded more than one transcript from each mode or more than one transcript for each week. The mode/week order in which transcripts were coded was randomized across coders.

A series of sessions were held to train the coders in the use of the coding system (described in a later section of this chapter). Because coding was from transcripts, rather than from ongoing interaction--either from video taped records or the actual conferences while they were in session-time could be taken to code every communication event in a variety of ways. This was necessary because of the multiple analyses required to satisfy the conceptual taxonomy for describing group performance.

As a result of the training sessions it was estimated, fairly accurately, that the coding of a single session transcript would require about 20 hours of coding time. For this reason, it was not feasible to have each transcript coded by two coders independently for a continuous reliability check. As an alternative, all coders coded the same samples of a dummy transcript (a transcript from an actual conference session that was not one of the 18 analyzed in the study), until the intercoder reliability on all communication units and all components exceeded .80.

This level of reliability was attainable partly because of the rule that coding be based upon the surface meaning of the words. Coders were trained not to "read in" meaning and to make as few interpretive judgements as possible. This undoubtedly resulted in some errors, particularly in the area of social emotional overtone e.g., "That's very good." would be coded as 'positive social emotional' although an audio analysis might show clearly that the remark was made sarcastically. It hardly need be mentioned that coding from typed transcripts loses all of the paralinguistic and kinesic information being communicated and, in addition to the loss of this information, there will be some coding misinterpretation when the linguistic, paralinguistic and kinesic bands are not complimentary. However, there is no obvious reason why misinterpretations of this type would not occur randomly across conference modes and weeks.

OPERATIONALIZING THE GROUP PERFORMANCE TAXONOMY

The organizing framework developed in Chapter I is intended to be used with any group conference regardless of the group task, group size, or

the individual or organizational makeup of the group members. However, a specific group involved in a specific task will have its own esoteric properties that must be determined to permit precise coding of communication events into the category arrays.

The Unit of Analysis Several alternatives were available for selecting a unit for defining a 'communication event'--a 'meaningful' phrase, the sentence, the completed thought, and the uninterrupted speech, were all considered.

The 'meaningful' phrase was discarded because it was often difficult to determine what constituted a meaningful phrase and, even had this been possible, the coding task would have been greatly increased if communication events had have been so finely divided. The sentence was not a very useful unit because, although people usually write in sentences, they rarely talk in sentences. For similar reasons, the completed thought was not very applicable because, in multi-person discussions, an individual's thought is often not completed, due to interruptions.

By a process of elimination, the 'uninterrupted speech' was selected as the unit of analysis upon which coding was performed. An uninterrupted speech was taken to be what a person said from the time he started speaking until someone else began to speak. Of the more than 8,000 communication units that were analyzed, less than 3% could not be coded using the uninterrupted speech as the analytic unit. Those that could not be coded by this unit tended to be fairly long, uninterrupted utterances where a distinct change occurred in either the content or the social emotional overtones. In these cases, the speech was broken into two or more units to reflect the shifts.

I CONTENT SPACE

Every communication unit was coded as either task or nontask related. Coding was upon the manifest or surface meaning of the unit, on the basis of whether or not it applied directly to the task. Task oriented communication was coded as either applying to (1) specific dimensions of the task, or to (2) general procedures for accomplishing the task.

(a) Task Content Dimensions This category refers to all of the separate dimensions of the task that the group could take into consideration in making their action selections. To establish these dimensions, all of the recommendations mentioned in the 'recommendations' section of the post-session questionnaires for all of the 47 sessions of the original study were content analyzed. Although a total of more than 300 different recommendations were made by all groups, the individual components of the recommendations could be separated into seven different dimensions, each with a variety of states or different aspects of the dimension. While the dimensions are related in the sense that each has implications for the others,they are clearly separate considerations of the task situation. The dimensions, as well as the other specific components of the taxonomy, are presented in Appendix B.

(b) Task Procedures A unit is coded as 'task procedures' if it concerns the task in general, rather than any of the specific dimensions of the task. Such units were catagorized as either explicitly (1) giving direction to the task, (2) asking for task direction, (3) giving role or behaviour direction, and (4) asking for role or behaviour direction.

(c) Nontask Content This is all of the interactions that are not explicitly related to the task, although, at some other level of analysis this might be important to task accomplishment i.e., might contribute to group development and maintenance. Included in this category are all conversation concerned with group members directly or indirectly familiarizing themselves with the others, and anecdotes about people, places and events that are not explicitly related to the task.

Coded separately within this category were all discussions about the communication mode. This would provide measures of the frequency and amount of time spent discussing the technological aspects of video and audio conferencing.

II TASK ENVIRONMENT

All communication units that were first categorized as 'task content dimensions' were further coded as to 'task area' and complexity of 'structure'.

The three task areas were (1) mapping the task environment, (2) action selections, and (3) action selection adjustments. Complexity of structure was minimally coded as either (1) unidimensional--only one content dimension of the task was considered in the unit, or (2) multidimensional--two or more content dimensions of the task were considered together in the unit.

(a) Mapping the Task Environment Mapping the task environment refers to all of the discussions of the various and possible dimensions of the task that are considered and represents the pool from which the group makes action selections. While the mapping of the task environment is a very necessary component of group behaviour, and the variety and complexity of the mapping behaviour is a measure of group performance, it represents only the first level of task accomplishment, and is not the major consideration in evaluating task accomplishment. Communication units defined as 'mapping' behaviour involve a specific dimension or dimensions of task content, and is information provided in the form of opinions, background, experiences, feelings, expectations, and clarifications. The information was coded as either (1) "asking" (one of the above),or (2) "giving" (one of the above).

(b) Action Selections

In the task provided in the study, the groups were required to make recommendations about their program in Human Communications. The action selections are, thus, the recommendations that the groups were able to make. The number and complexity of the recommendations emanating from a group is considered, in this study, to be a major evaluation of group performance.

(c) Action Selection Adjustments This refers to all communication that adjusts,elaborates, or in any way modifies or attempts to modify an action selection (recommendation) after it has been made. It is also considered an important criterionfor evaluating group performance, since it provides a measure of the extent to which the recommendations were seen as sufficiently important to provoke further discussion.

(d) Structure of the Task Environment Mapping, actions and adjustments were further coded as (1) unidimensional or (2) multidimensional. Conceptually it is possible to conceive a model that is much more refined

than the unidimensional/multidimensional dichotomy that was used in this study. However, operationalizing a model that specifies dimensions, states, and rules for their integration requires a much greater appreciation of the absolute properties of the task environment than was possible. Our dichotomy does, however, provide a measure of the extent to which the group tended to treat the aspects of the problem in a compartmentalized way as opposed to treating the aspects in combination. Defining a unit as multidimensional says nothing, of course, about the quality with which dimensions are integrated, but it must be assumed that some integrating principle, even if it remains undefined, was operating. Furthermore, treatment of the dimensions one at a time precludes the necessity or opportunity of integration. It is proposed, that the greater the integrative complexity of the task dimensions, the greater the potential value of the action selections made.

III INTERPERSONAL ENVIRONMENT

Unlike the components of 'task environment' which were applicable only to units defined as 'task content dimensions', the social emotional categories were applied to all communication units. Each unit was coded as (1) Positive or Supportive, (2) Social emotional uncertainty, (3) Negative or Nonsupportive, or (4) Neutral. The 'neutral' category was not actually coded as a unit was considered 'neutral' if it was not coded as one of the other three.

In addition to the social emotional categories of the interpersonal environment, the addressing or routing of the communication units was coded in one of three categories. A communication unit was addressed to either (1) a member or members of the other (mediated) node, (2) a member or members of one's own (immediate) node, or (3) to all group members. When it was not clear that the speaker was addressing primarily either members of the immediate or mediated node, the unit was coded as being addressed to all group members. In the face-to-face conferences for the purpose of establishing a basis of comparison with the teleconferences, the mediated node was taken to be the group members on the other side of the table, because of the physical similarity between seating arrangements in all three conference modes.

The following is a description of the various social emotional categories.

(1) Positive

Communication units coded as 'positive' indicated some form of integration of supportiveness for another group member or members. These were categorized as either (i) agreement (low intensity) or (ii) integration (high intensity).

(i) Agreement When the speaker indicates verbally that he understands, concurs, accepts or shows some form of mild satisfaction with another person or persons, this was coded as low intensity agreement. This included the use of such phrases as "yes", "okay", "right", "I think that's right", "I agree with that point" and similar statements that, while indicating acceptance, did not contain additional information that explicitly raised another's status or bestowed praise.

(ii) Integration The more intense positive social emotional units were those that indicated strong agreement and explicitly praised the person making the statement. Also included in this category were attempts to sooth hostility, indications of tolerance, contributions to group solidarity, attempts to assist another in the formulation of an idea and any other overt attempt to reward another person or persons. Coded as 'integration' rather than just 'agreement' would be phrases like, for example, "That's a great idea", "I think John has really put his finger on the problem", and "I don't think the two of you are in basic disagreement at all".

(iii) "We" A separate consideration, that could be coded in conjunction with any other category in the taxonomy was the use of the word 'we' or similar words or short phrases when they referred to the whole group, as opposed to some subgroup of the conference. This is considered an unobtrusive index of the cohesiveness of the group. To the extent that the cohesiveness of the members in the three communication modes is about the same, it can be argued that the frequency with which 'we' type words are used would also be about the same.

(2) Negative

Negative social emotional communication categories are the polar opposites of the 'positive' codes i.e., (i) disagreement (low intensity) or (ii) disintegration (high intensity).

(i) Disagreement As a group maps a task environment it is unlikely that all ideas will be equally acceptable or unacceptable to all members as they attempt to make action selections. Disagreement is regularly indicated in this 'normal' process by a variety of phrases. Coded as low intensity 'disagreement' were such phrases as "I'm not sure about that", "I can't agree (entirely)", "no", and similar phrases that do not explicitly indicate that the speaker has lowered his opinion of the person or people to whom he is referring. Defining a communication unit in this category meant that the form of disagreement was considered mild. There was no personal attack on another person or persons.

(ii) Disintegration Negative social emotional communications of high intensity were those of strong disagreement or disapproval with an idea or suggestion that at the same time indicated a personal attack. Not only did the speaker disagree with someone or group of people, an explicit attempt to lower status was also included. This usually took the form of phrase selections with obvious highly negative connotations. For example, "That's a stupid (foolish, simple minded, idiotic) idea." would be coded as 'disintegration' rather than simply 'disagreement'.

Also included in this category were communication units where the speaker was emotionally defending himself or someone else and at the same time implying a negation of anyone who did not understand or agree. Any intolerance for another person(s) or his ideas or statements of boredom or other psychological withdrawal were coded as 'disintegration'.

(iii) "You" The argumentation for this category parallels that of the "we" category. Uses of the word 'you', 'we', 'us', 'them', when used to distinguish between the two nodes in the system (as opposed to referring to an individual or the whole group) were considered to be an index of whole group noncohesiveness. Also, considered in this category were the more obvious phrases such as 'our (your) end' and 'you people over there'.

Because the face-to-face conference is very different from the teleconference in spatial relationships, it is unlikely that this type of subgroup differentiation will be manifest. However, in teleconferencing, if the 'you/us' distinction is purely locative without cohesiveness implications, about equal use of these terms would be expected to occur in both video and audio conferencing.

(iv) Group Task Depreciation In pretesting the coding categories and in training the coders, one further class of disintegrative communication was detected. This type may or may not lower group cohesiveness but does lower group task cohesiveness i.e., breaking down the group as a task group. The communication overtly deflates the task or its objectives or suggests that the group engage in nontask activities which includes suggestions that the session end prematurely.

(3) Social Emotional Uncertainty

The uncertainty aspect of the social emotional environment of the group provides an index of the problems encountered by individual group members in the different communication modes, and their willingness to express and discuss these problems. All communication that explicitly inquired about direction, help, cooperation, understanding, tolerance, signs of satisfaction from others, and agreement or comprehension, were coded in this category. These communications cannot be classified as either 'negative' or 'positive' in themselves since they almost always imply alternatives for further behaviour. Statements such as "Do you understand what I meant?", "Can you add anything to this?" or "I'm not sure what's happening." express uncertainty, not only about aspects of the existing environment, but also about the responses that such statements might elicit. The positive/negative dimension of the encounter is thus dependent upon the response elicited rather than the uncertainty expressed.

Another aspect of interpersonal uncertainty, coded separately from the above, concerns the need for confirmation that someone or some others are still involved or, with respect to audio conferencing, if group members are still even physically present at the mediated node. Questions such as "Are you still with us?", "Are you still there?" and "Are you listening?" are examples of request for confirmation. While request for agreement are of the variety "Am I right?", requests for confirmation essentially ask "Do I still exist (for you)?"

It is unlikely that confirmation-seeking communication will occur with great frequency in any conferencing situation, but when it does occur, it indicates a rather extreme form of perceived uncertainty about the continued existence of the group.

Addressing A communication unit was considered to be addressed to the 'immediate' group if either (1) the speaker was talking primarily to a specific person or persons in the immediate node, or (2) it was clear from the context in which the communication was imbedded that the primary target was the immediate node. Communication coded as addressed to the 'mediated' group was similarly categorized. A communication was considered as addressed to 'the whole group' if, either, it was clear that the remark was not primarily and specifically intended for a particular person or persons, or there was no cue as to the primary receiver(s).

The principles for determining addressing in the face-to-face conference situation were the same as the above, except that those on the other side of the conference table were considered as the 'mediated node' and those on the same side of the table as the speaker were considered as the 'immediate node'.

STATISTICAL ANALYSES

The data from the various classifications of the group performance taxonomy are analyzed and reported in terms of conference mode and week comparisons. The comparisons are almost entirely in the form of proportions and relative proportions of both the frequency with which the communication units occured and the length of the communication units. While frequency and length would yield identical information if all communication units were the same length, the fact that they are not suggests that both frequency and length will provide different and useful information.

Thus, the analyses are not statistically elegant. This was unavoidable due to the characteristics of the data. The most traditional statistical models used in social science research, which permit the testing of statistical significance of differences, all make the assumption that the data points are random selections from a definable population. There is, however, nothing random about the data being analyzed here. On the contrary

the communication units are nonrandom in that each is dependent upon previous units and very much a function of what had already been said in the conference. Therefore, to report the statistical significance of differences would be in violation of the assumptions underlying the statistical model. It can be noted, in passing, however, that the subroutines used in determining the frequencies and proportions automatically calculated the significance of the differences (assuming randomness and independence of the units) and that differences that we discuss and argue are socially significant, were all statistically significant. However, with a data base of nearly 8,500 cases, even fairly small, perhaps socially insignificant, differences might reach statistical significance, even if the assumptions of randomness and independence were not violated.

We are currently attempting to develop a program that will make more powerful use of the processual data of the type we have collected, and that does not depend upon the assumptions of randomness or independence of units for statistical test. This will permit a time-ordering of events for different analyses of the interrelationships among components in the taxonomy.

The present analyses will, however, permit comparisons of the degree of coexistence of the various component of group performance in the three conference modes. Unequivocal statements of the causal linkages between components will not be possible, although the nature of the relationship can often be rationally inferred.

Footnotes:

1 Weston and Kristen, op. cit., Chapter II.

2 One member was missing in one of the video sessions in the third week.

CHAPTER III

RESULTS

GENERAL CHARACTERISTICS OF THE CONFERENCE SESSIONS

This section describes the characteristics of the conferences in the three modes and some broad communication behaviours that are relevant to the analysis of the performance taxonomy.

Although all groups theoretically had 45 minutes for each session, in practice the sessions were shorter because of task instruction time, waiting for a late member or members to arrive, and possibly finishing a session a few minutes before the end of the alloted time. On the average, sessions were slightly over 37 minutes in duration and the average session length in each mode was within a minute of this. There was little difference in the total number of words spoken in the face-to-face (face) and video teleconference (video) conditions, but both said considerably more than did the audio conferences (audio) (Table 1).

However, while least was said in audio, people spoke more often i.e., recalling that a communication unit of analysis (unit) was taken to be what one person said from the time he started speaking until someone else started speaking, there were more than 50% more communication units in audio than in face and 12% more than in video. Since the calculation of words per unit is based upon more than eight thousand units, the estimates are considered highly stable, and it seems clear that teleconferencing is characterized by relatively shorter individual utterances, and that audio utterances are profoundly shorter than those in face-to-face groups. The speaker 'holds the floor' much longer in face-to-face than in audio and considerably longer than in video. Rather than speculating at this time as to either the reasons for this or the implication it might have for group performance, such discussion will be reserved until performance data are considered.

Table 1: General Characteristics of the Conference Sessions

	Audio	Video	Face-to-Face	Total
Conference Sessions	6	6	6	18
Words Spoken	36,229	39,221	40,166	115,606
Communication Units	3,281	2,938	2,137	8,356
Average words/unit	11.0	13.3	18.8	13
Average words/unit relative to face	59%	71%	-	-
Average words/unit (audio/video)	83%	-	-	-
Conference minutes	221	224	226	671
Average words/minute	164	175	178	172
Average words/minute relative to face	92%	98%	-	-
Average words/minute (audio/video)	94%	-	-	-
Average units/minute	14.8	13.1	9.5	12.5
Average units/minute relative to face	156%	138%	-	-
Average units/minute(audio/video	113%	-	-	-

The fact that less was said in audio in comparable time periods with the other modes supports the anecdotal observation that there are more pauses in audio, while people wait for someone else to start speaking. The only other interpretation, that people speak more slowly in the audio conditions, is not very compelling, and sampled audio tape speech rates (while speaking) indicated no differences across communication modes. Again, the likely reasons for this will be discussed later in conjunction with other data.

Because there are fewer words but many more communication units in audio, comparing communication performances across modes solely in terms of either words or units would be very misleading. For this reason,both are reported for all components of the taxonomy. However, for certain of the classifications, word comparisons seem to have higher information value, for other classifications,comparisons based upon the frequency with which units occur seems intuitively more sensible; and for still other components, both word and unit comparisons seem interesting to consider.

In comparing the extent to which the groups are able to map a task environment, for example, total words spoken appears to be a better analytic unit than frequency of communication units, since the former corresponds more closely to discussion time. In comparing interpersonal hostility, however, the frequency with which high intensity disintegrative remarks occur may be a better measure than considering the number of words used in the hostile remarks e.g., "I wish you would keep quiet!" can hardly be considered three times as much hostility as "Keep quiet!" Still other component comparisons such as the decisions (action selections) that the groups generate might best be understood if both the number and length of the decisions are considered.

While not intended as an apology, it hardly need be stressed that human language is extremely, perhaps infinitely, complex and that any attempt to capture this complexity by any manageable classification system, regardless of the unit of analysis selected, will necessarily fail to capture

all of the potential richness.

The following section reports the findings of the analyses of the various components in the organizing framework of the study.

THE GROUP PERFORMANCE TAXONOMY

I COMMUNICATION CONTENT SPACE

All communications were broadly categorized as either (1) explicitly task related, or (2) nontask related. Task related units were further broken down into either (a) relating to specific content dimensions of the task or (b) relating to procedures for dealing with the task in general or organizing the group. Nontask units were differentiated into (a) those discussions about the communication technology and (b) all other nontask discussion.

Task Content Dimensions There was little difference in total discussion devoted to the specifics of the problem in video and face-to-face conferences. The face-to-face groups, however, spent about one-third more time discussing the task than did the audio groups and the video groups about 25% more (Table 2). The audio, video and face conditions respectively spent 55%, 64% and 66% of the total conference time discussing the various specific aspects of the task situation. The specific nature of these discussions constitutes a major segment of the taxonomy and is discussed in detail in a later section (Task Environment).

Task/Group Structure Communication of this type concerned all of the organizational and procedural discussion required to orient the group members to the task at hand. Not included here are any communications that concern the specific content dimensions of the task.

It is perhaps not too surprising that those in the teleconferences devoted considerably more time to group/task organization than did those in the familiar face-to-face mode. The lack of visual cues in the audio mode appears to have made the organizational problems even more difficult, since about 50% more time was devoted to these concerns in audio than in video conferencing. It should also be noted that the organizational and procedural maintenance factor remained about the same for all three weeks in audio but

Table 2: Summary Analysis of Communication Content Space

	Audio	Video	Face-to-Face
I TASK RELATED			
(1) Task Content Dimensions			
Words	20,029	25,082	26,673
Communication units	1,505	1,531	1,293
Average words/unit	13.31	16.38	20.6
Words % relative to face	75%	94%	-
Words % audio/video	80%	-	-
Words % of all communication	55%	64%	66%
(2) Task/Group Procedures			
Words	2,256	1,574	616
Communication units	274	166	56
Average words/unit	8.23	9.48	11.00
Words % relative to face	366%	256%	-
Words % audio/video	143%	-	-
Words % of all communication	6%	4%	2%
Total task related communication	61%	68%	68%
II NONTASK RELATED			
(1) Nontask Content			
Words	13,944	12,565	12,877
Communication units	1,502	1,242	788
Average words/unit	9.28	10.11	16.34
Words % relative to face	108%	98%	-
Words % audio/video	111%	-	-
Total nontask communication	38%	32%	32%

Table 3 : Group/Task Procedural Considerations - Mode by Week

	Audio		Video		Face	
	Words	Units	Words	Units	Words	Units
Conference Week 1	980	95	503	37	124	7
Conference Week 2	630	98	858	106	73	9
Conference Week 3	646	81	213	23	419	40
Total	2256	274	1574	166	616	56
% relative to face	(366%)	(489%)	(256%)	(296%)	-	-
% audio/video	(143%)	(166%)	-	-	-	-
Addressing: (over all weeks)	Words (%)[a]	Units	Words (%)	Units	Words (%)	Units
Immediate Node	217 (9)	38	279 (18)	43	29 (5)	5
Mediated Node[b]	1100 (49)	160	642 (41)	67	36 (6)	9
All Members	939 (42)	76	653 (41)	56	551 (89)	42
Total	(100)		(100)		(100)	
Mediated/Immediate Procedural Information Ratio	(5.07/1)		(2.30/1)		-	

[a] Addressing percentages based upon communication units.

[b] The mediated node in the Face-to-Face mode is the group members on the other side of the conference table.

in video was most pronounced in the second week, the least productive of the video sessions from the standpoint of task accomplishment (Table 3).

Virtually all of the procedural communication in face-to-face was directed at the whole group with only a sprinkling of remarks routed to a specific individual. This is in rather sharp contrast with the teleconference modes where the specific routing of information is very pronounced. In these modes nearly half of the information is routed primarily to the mediated node and in audio, less than 10% of the time spent in general organization is devoted to organizing the immediate node. The concern, particularly in audio, appears to be with what the mediated node, rather than one's own node, is doing, thinks should be done, or should do.

It should be assumed that group/task organization, since it occurs, is seen as necessary for the accomplishment of the group task, and therefore is desirable. However, time devoted to general procedures necessarily impinges on the time that can be spent on the specifics of the task itself, and the audio conferences clearly required the most effort to become and remain task organized.

Nontask Dimensions While the audio groups did tend to stray from the task more than the other two groups, the differences are not spectacular. About 10% more of the available time was spent in nontask discussion in audio than video or face-to-face (Table 2).

Of all the various types of nontask discussion that could occur, only discussion specifically about the communication technology used in the conference was tagged for a separate analysis. Because the technology in the teleconferences was novel, it was felt that this would occassion considerable discussion within the groups. This, however, was not the case. With the exception of the first week in the audio conferences, there was almost no discussion about the technology and, even in that first week, relatively little time was devoted to it (Table 4).

Table 4: Nontask Discussion of the Conference Technology

	Audio		Video		Face-to-Face	
	Words	Units	Words	Units	Words	Units
Conference Week 1	234	35	41	4	0	0
Conference Week 2	33	9	0	0	7	1
Conference Week 3	0	0	31	6	18	1
Total	267	44	72	10	25	2
% audio/video	371%	440%	-	-	-	-

II TASK ENVIRONMENT

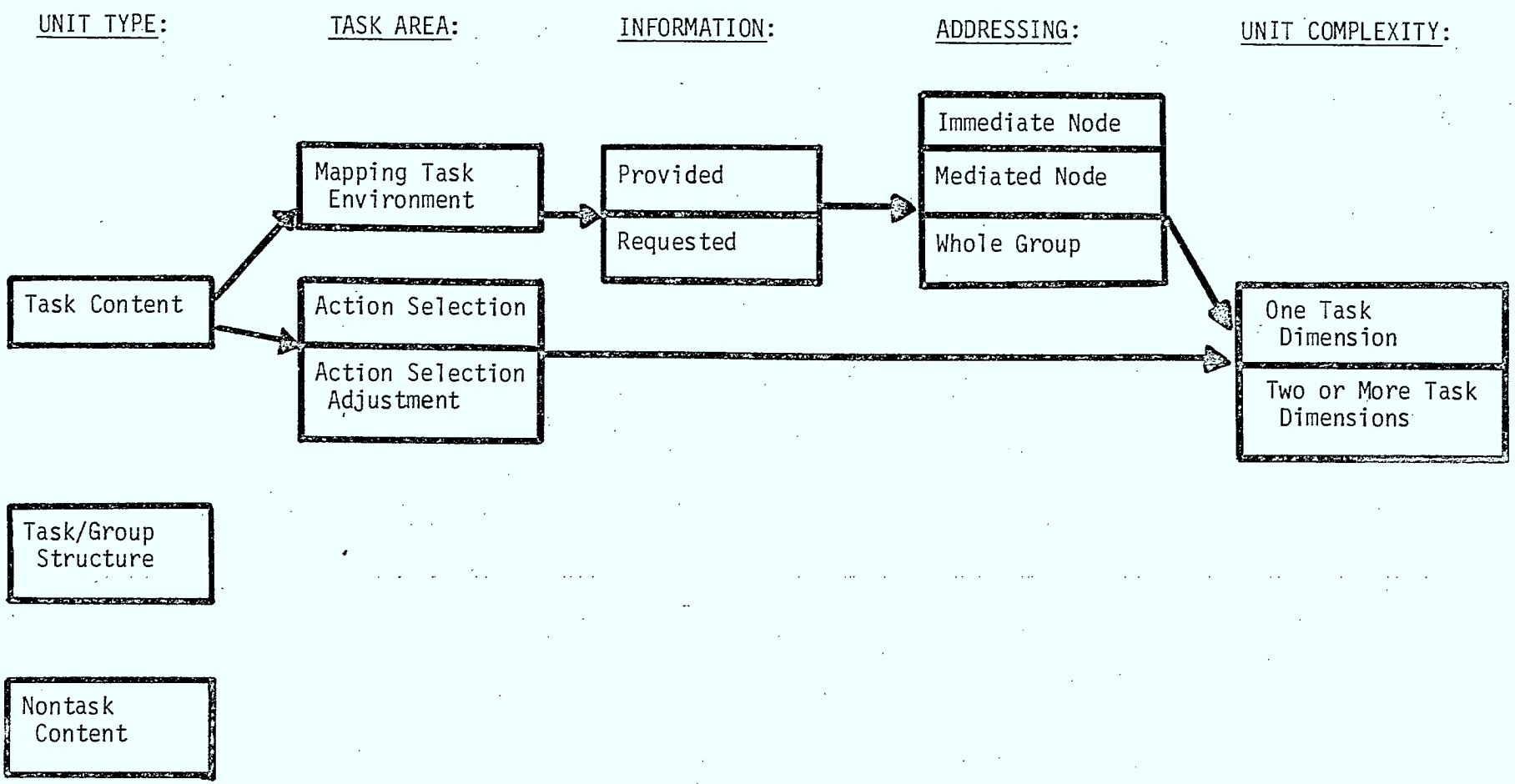
Communication units that were tagged as discussing a specific dimension or dimensions of the task, and only these units were then categorized in a variety of ways. This provided for a more precise description and interpretation of the manner in which the groups dealt with the task. The analyses, schematically presented in Figure 4, taken together represent the research effort to evaluate the task accomplishment component of group behaviour.

Mapping the Task Environment All discussion of the dimensions of the task that were neither 'action selections' nor 'discussion and refinement of the action selections' were considered to be mapping behaviour. The face-to-face conferences spent more time mapping the task environment than did either the video or audio groups--30% more than the former and 10% more than video (Table 5).

It is, however, more significant that in audio, the mapping behaviour was characterized by 'requesting' information considerably more and 'providing' information considerably less than in either video or face-to-face conferences. The audio conferees made twice as many specific requests for information as did either the video or face-to-face groups! When the mode comparisons are based upon words in the requests, rather than frequency of requests, the differences are less spectacular which means that the requests for information in audio were more cryptic.

The ratio of providing/requesting task information within audio was about 4 to 1 while within the video and audio conditions the ratios were between 6 and 7 to 1.

Rather than restating it for each analysis it will be more efficient to point out at this time that in almost all types of communication analyzed, people in teleconference modes address their remarks more to individuals or subgroups than do those in face-to-face situations. Discussion is addressed to members of the mediated mode much more frequently than to either the whole group or members of the immediate node. Furthermore, this pattern is almost always (for almost all communication types) more exaggerated in audio than in video. On the other hand, in face-to-face groups by far the greatest amount of communication is not specifically routed but presented to the whole group.



Analysis of Task Environment

Figure 4

Table 5 : Task Environment Mapping
Mode by Week (over both levels of complexity)

Provide Task Environment Information	Week	Audio		Video		Face	
		Words	Units	Words	Units	Words	Units
	1	5569	402	5813	334	9222	514
	2	4094	328	4830	437	4602	176
	3	3416	299	4953	355	4652	262
	Total	13079	1029	15569	1126	18476	952
% relative to face		(71%)	-	(84%)	-	-	-
% audio/video		(84%)	-	-	-	-	-
Request Task Environment Information	1	1224	120	640	61	1166	78
	2	1289	148	996	62	1073	38
	3	687	76	806	53	465	48
	Total	3200	344	2442	176	2704	164
% relative to face		(118%)	-	(90%)	-	-	-
% audio/video		(131%)					
Total Task Environment Communication	1	6793	522	6453	395	10388	592
	2	5387	476	5826	499	5675	214
	3	4103	375	5759	408	5118	310
	Total	16279	1373	18038	1302	21181	1116
% relative to face.		(77%)	(123%)	(85%)	(116%)	-	-
% audio/video		(90%)					
Provide/request Information Ratio		(4.08/1)		(6.37/1)		(6.83/1)	

Specifically, although in audio there were twice as many requests for task information than in the other conditions, very few of these requests were made of the immediate node and most were made of the mediated node. In face-to-face most requests were made to all or any group member and in video the pattern of requests fell between audio and face-to-face (Table 6).

This is the first of a number of indications to be reported that suggest that the audio only medium of group interaction inhibits the disclosure of oneself to others, particularly to members of the unseen group.

The mapping of the task environment was also analyzed in terms of the complexity of the individual units in the discussion. If the unit dealt with only one factor it was categorized as unidimensional (simple), but if more than one factor or dimension was considered, it was categorized as multidimensional (complex). While this is perhaps a rather crude dichotomy, it does provide some measure of the extent to which the groups viewed the interdependencies between dimensions.

Since total mapping communication was least in audio, it is understandable that there would be less of both levels of complexity in their discussions. However, the modal differences in amount of unidimensional mapping is relatively small compared with the amount of multidimensional mapping (Table 7). There was only slightly more than half as much complex mapping in audio compared with face-to-face; and, about two-thirds the amount occuring in video. The simple/complex ratio within audio was in the order of 4 to 1, while within video or face-to-face the ratio was less than 3 to 1.

Action Selections The action selections required of the groups in this investigation, were "to make recommendations" for changes in a program in which they were all involved. The number, length and complexity of the suggestions were analyzed.

While not implying a one-to-one ratio, it might be expected that,since audio devoted less time to mapping the task environment and the complexity of the map was low relative to the other modes, the resulting action selections would be fewer in number and less complex (Table 9). By itself this finding is not startling. However, the magnitude of the difference is considerably greater than anticipated by assuming a one-to-one

Table 6 : Task Environment Mapping--Addressing by Mode
(over all weeks)

		Audio			Video			Face		
		Words	(%)[a]	Units	Words	(%)	Units	Words	(%)	Units
Provides Task Environment Information	Immediate Node	2290	(17)	167	4509	(29)	337	2386	(19)	184
	Mediated Node	7159	(55)	640	6370	(41)	552	3366	(25)	234
	All Members	3630	(28)	222	4717	(22)	237	12724	(56)	534
			(100)			(100)			(100)	
Request Task Environment Information	Immediate Node	301	(9)	45	369	(15)	35	920	(14)	23
	Mediated Node	1808	(57)	217	1354	(55)	95	348	(20)	32
	All Members	1091	(34)	82	719	(30)	46	1436	(66)	109
			(100)			(100)			(100)	
Total Task Environment Information Exchanged	Immediate Node	2591	(16)	212	4878	(27)	372	3306	(16)	207
	Mediated Node	8967	(55)	857	7724	(43)	647	3714	(18)	266
	All Members	4721	(29)	304	5436	(30)	283	14160	(66)	643
			(100)			(100)			(100)	

[a] All (%) are based on words rather than units

Table 7 : Task Environment Mapping Complexity by Mode (over all weeks)

Unidimentional Mapping	Week	Audio		Video		Face-to-Face	
		Words	Units	Words	Units	Words	Units
	1	4603	365	4741	321	7989	459
	2	4794	420	5336	450	3366	135
	3	3681	334	3089	223	4365	262
	Total	13078	1119	13166	994	15720	856
% relative to face		(83%)		(84%)		-	
% audio/video		(99%)		-		-	
Multidimentional Mapping	1	2190	157	1712	74	2399	133
	2	589	56	490	49	2309	79
	3	422	41	2670	185	752	48
	Total	3201	254	4872	308	5460	260
% relative to face		(57%)		(89%)		-	
% audio/video		(66%)		-		-	
Simple/Complex Mapping Ratio		(4.09/1)		(2.70/1)		(2.88/1)	

correspondence between mapping and action selections. For audio the mapping/action ratio was about 18 to 1 and for video and face-to-face 10 to 1. In other words, assuming that the 'absolute' quality of individual recommendations was about the same in all communication modes, video and face-to-face were nearly twice as efficient as was audio--audio discussion of dimensions of the situation resulted in recommendations being made only half as often as in the other modes. This relative inability to translate problem mapping into action selections may be because of lower utility of the mapping behaviour in audio and/or it may be further evidence of audio conferees' unwillingness to disclose themselves to others (Table 8).

There is evidence that the task environment mapped in audio was not sufficiently complex and interesting to provoke action selection activity at the same level as in the other modes. Although there were fewer recommendations in audio at both levels of complexity than in the other modes, the number of unidimensional recommendations in audio more closely approaches the number made by video and face-to-face groups than does the number of multidimensional recommendations. The simple/complex recommendation ratio within audio calculated on words was more than 3 to 1, within video 2 to 1, and within face about 1½ to 1. Further evidence that the audio conference found the task less interesting is presented in Table 18 and will be discussed later in this chapter.

It should also be noted that the video conferences made a somewhat greater number of recommendations than did the face-to-face groups. Complex recommendations were similar in number in both modes but video made more unidimensional recommendations. The difference is not great, however, the data at least provide no evidence that video conferencing is in any way less productive than face-to-face.

Action Selection Adjustment The discussions, refinements and adjustments that a group makes to its action selections, after the action selections are "on the floor" is conceptually difficult to differentiate for other mapping communication. This category is, in a sense, very much post-action selection mapping. This poses some problems in interpreting comparisons

Table 8 : Action Selections (Recommendations)
Complexity by Mode by Week

		Audio		Video		Face	
Unidimensional Recommendations	Week	Words	Units	Words	Units	Words	Units
	1	464	21	1138	35	780	21
	2	389	16	576	23	626	20
	3	947	19	1312	26	825	35
	Total	1800	56	3016	84	2231	76
% relative to face		(81%)	(74%)	(136%)	(111%)	-	-
% audio/video		(59%)	(67%)	-	-	-	-
Multidimensional Recommendations	1	224	8	380	11	553	10
	2	9	1	187	5	593	13
	3	303	12	947	22	370	14
	Total	536	21	1514	38	1516	37
% relative to face		(35%)	(52%)	(100%)	(103%)	-	-
% audio/video		(35%)	(55%)	-	-	-	-
Total Recommendations	1	688	29	1518	46	1333	31
	2	398	17	763	28	1219	33
	3	1250	31	2259	48	1195	49
	Total	2336	77	4540	122	3747	113
% relative to face		(62%)	(68%)	(121%)	(108%)	-	-
% audio/video		(51%)	(63%)	-	-	-	-
Simple/Complex Recommendation Ratio		(3.36/1)	(2.67/1)	(2.00/1)	(2.21/1)	(1.47/1)	(2.05/1)

Table 9 : Adjustments to Action Selections (Recommendations) Complexity by Mode by Week

		Audio		Video		Face-to-Face	
Unidimensional (Simple) Adjustments to Recommendations	Week	Words	Units	Words	Units	Words	Units
	1	298	14	642	25	680	15
	2	290	10	833	38	0	0
	3	673	24	404	16	537	29
	Total	1261	48	1879	79	1217	44
	% relative to face	(104%)	(109%)	(154%)	(180%)	-	-
	% audio/video	(67%)	(61%)	-	-	-	-
Multidimensional (Complex) Adjustments to Recommendations	1	0	0	303	13	98	2
	2	0	0	167	9	52	1
	3	153	7	155	6	378	17
	Total	153	7	625	28	528	20
	% relative to face	(29%)	(35%)	(118%)	(140%)	-	-
	% audio/video	(24%)	(25%)	-	-	-	-
Total Adjustments to Recommendations	1	298	14	945	38	778	17
	2	290	10	1000	47	52	1
	3	826	31	559	22	915	46
	Total	1414	55	2504	107	1745	64
	% relative to face	(81%)	(86%)	(143%)	(167%)	-	-
	% audio/video	(56%)	(51%)	-	-	-	-
Simple/Complex Adjustment Ratio		(8.24/1)	(6.9/1)	(3.00/1)	(2.8/1)	(2.30/1)	(1.6/1)

Table 10 : Breakdown of Task Content Discussion

		Audio		Video		Face-to-Face	
		Words	Units	Words	Units	Words	Units
(1) Task Environment Mapping	Simple	13078	1119	13166	994	15720	856
	Complex	3201	254	4872	308	5460	260
	Total	16279 (81)	1373	18038 (74)	1301	21181 (79)	1116
(2) Action Selections	Simple	1800	56	3026	84	2231	76
	Complex	536	21	1514	38	1516	37
	Total	2336 (12)	77	4540 (18)	122	3747 (14)	113
(3) Action Selection Adjustment	Simple	1261	48	1879	79	1217	44
	Complex	153	7	625	28	528	20
	Total	1414 (7)	55	2504 (10)	107	1745 (7)	64
Total Task Content Discussion		(100)		(100)		(100)	
		20029	1505	25082	1531	26673	1293
Time % relative to face		(75%)		(94%)		-	
Time % audio/video		(80%)		-		-	
		%		%		%	
Unidimensional Communication		16139 81	1223	18071 72	1157	19168 72	976
Multidimensional Communication		3890 19	282	7011 29	374	7505 28	317

between modes on this component of the taxonomy i.e., to the extent that a group is able to map the task environment thoroughly before taking action selections, it can be argued that there will then be less necessity to later adjust the action selections.

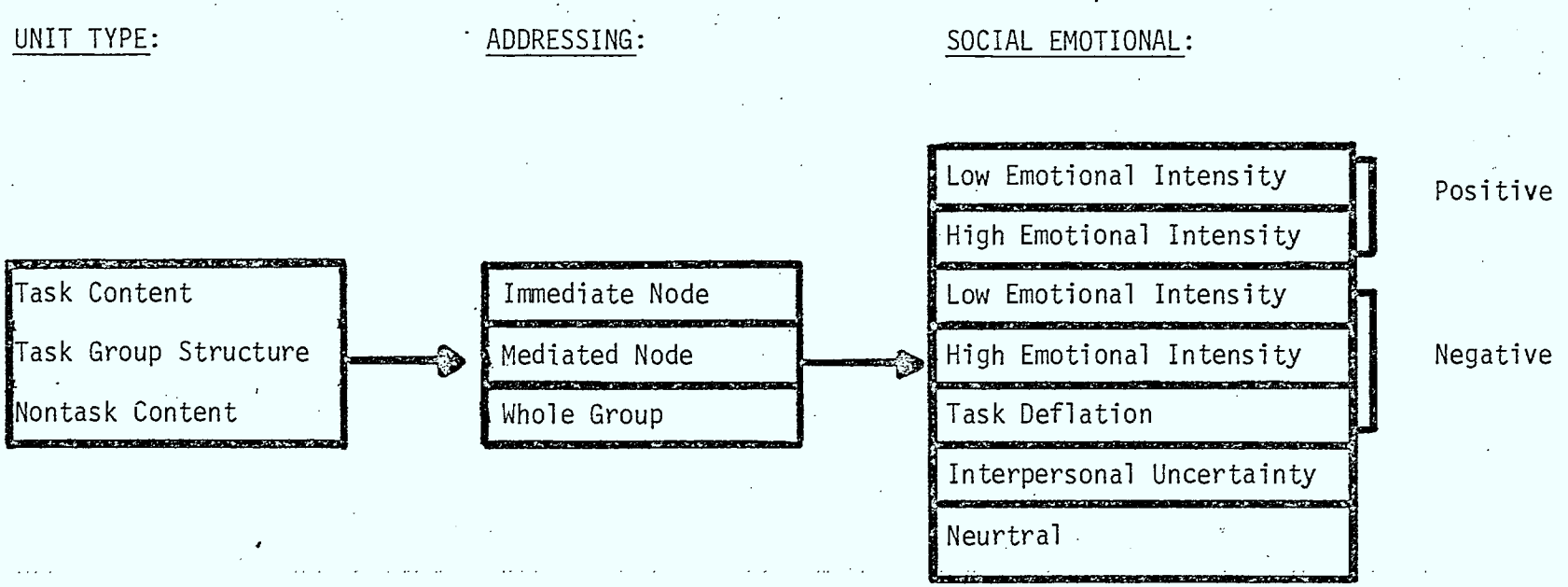
Since both video and face-to-face conferences mapped the task environment more thoroughly and complexly than did those in audio, it might be expected that there would be less need for these groups to discuss and refine recommendations once they had been made. This, however, was not the case. In addition to mapping the task environment more thoroughly than did audio before making recommendations, the other modes also discussed and refined their recommendations more thoroughly than did the audio groups (Table 9). Again, the pattern was more pronounced in the post-action complex adjustments, where audio discussion was provoked only about ¼ as often as in the other modes. The simple/complex adjustment ratio within audio was, when balanced between both words and and frequency was in the order of 7 to 1 within audio, 3 to 1 within video and 2 to 1 within face-to-face.

The video groups also discussed and refined their recommendations considerably more in absolute terms than did the face-to-face groups. This was the case for both simple and complex adjustment. Whether words or frequencies of remarks are used in the calculation, the video/face-to-face adjustment ratio is around 3 to 2.

Finally, to conclude the findings of the task environment considerations, a summary of the three components of task performance, mapping, actions, and action adjustments, is presented in Table 10. Task performance in audio was consistently and definably lower than in the other modes. Also, while there were not remarkable differences between video and face-to-face, if there is an advantage, it appears that task performance in video was greater than in the face-to-face groups.

III INTERPERSONAL ENVIRONMENT

The previous sections were concerned primarily with the 'content' component of the group interaction. The 'relational' component--the nature of the relationships between group members in the three communication modes--is the focus of the present section. Determining the interpersonal atmospheres that were manifest in the communication exchanges should provide at least a partial explanation of the relatively low level of task



Analysis of Interpersonal Environment

Figure 5

performance in the audio condition. All communication units were analyzed in terms of social psychological states of the speaker as reflected by what he said and to whom he was addressing his remarks. The analyses of the interpersonal environment that were undertaken are schematically presented in Figure 5.

Positive Social Emotional All remarks that were positive in their social emotional overtones, as operationalized in Chapter II, were divided into either 'low' or 'high' intensity. Low intensity remarks were those that, while expressing agreement, comprehension, or understanding, did not overtly praise or raise the status of the speaker or any subgroup he might be representing.

'Agreement'--Low Emotional Intensity Recalling that, in general, the audio condition is characterized by shorter individual utterances and more frequent shifts in speaker, modal comparisons are quite different if the analyses are based upon the length of the remarks as opposed to the frequency of statements of 'agreement'.

Collapsed across weeks and addressing patterns, and calculated on 'length', agreement in audio was about half that in face-to-face and two-thirds that in video; calculated on 'frequency' of remarks, audio was slightly more than face-to-face and slightly less than video (Table 11).

Overall statements of agreement steadily decreased over the three weeks in audio but the patterns in video and face-to-face were less straightforward, although in both of these modes there were more statements of agreement in the third week than there were in the first.

In this analysis, as in all of the social emotional analyses, the face-to-face groups overwhelmingly addressed the whole group rather than individuals e.g., they were more likely to say "I agree (disagree, etc.) with him (as opposed to 'you')". For the teleconference groups the pattern was, to varying degrees across social emotional categories and teleconference modes, reversed. It should also be noted that, even by chance, the mediated/immediate addressing ratios are not 1 to 1 but rather 3 to 2, since there are only two other people in the immediate node (besides the speaker) and three others in the mediated node.

Table 11: Positive Social Emotional--Low Intensity Agreement
(1) Mode by Week (2) Mode by Addressing

(1) Agreement	Audio		Video		Face-to-Face	
Week	Words	Units	Words	Units	Words	Units
1	1444	281	1407	169	2002	212
2	914	162	1335	267	1036	88
3	648	134	1753	210	2614	252
Total	3006	577	4495	646	5652	552
% relative to face	53%	105%	76%	117%	-	-
% audio/video	67%	89%	-	-	-	-

(2) Addressing (over all weeks)		(%)[a]			(%)			(%)	
Immediate Node	596	(21)	123	1373	(34)	222	992	(21)	114
Mediated Node[b]	1962	(68)	389	2403	(57)	367	1483	(27)	150
All Group Members	448	(11)	65	719	(9)	57	3177	(52)	288
Total	3006	(100)	577	4495	(100)	646	5652	(100)	552
Mediated/Immediate Agreement Ratio	(3.3/1)		(3.2/1)	(1.8/1)		(1.6/1)	(1.5/1)		(1.3/1)

[a] Addressing percentages based upon communication units.

[b] The mediated node in the Face-to-Face mode is the group members on the other side of the conference table.

'Agreement' in the video conferences was about evenly balanced between the nodes--people were as likely to agree with someone within their own node as with someone at the other node. Somewhat surprisingly, however, the audio groups verbalized simple statements of agreement with the mediated node much more often than with the immediate node. Since this pattern held for statements of simple disagreement as well, it may be attributable solely to the fact that the audio groups direct most of their communication to the other node.

Integration--High Emotional Intensity Communication coded as high intensity emotional integrations included all statements that raised the status of others, were otherwise extremely supportive, or were overt attempts to smooth hostilities. In retrospect, these categories should have been separated, since they are somewhat confounded, i.e., the incidence of this type of maintenance behaviour is related to the need for maintenance--soothing hostilities presumes that hostility exists. For this reason, rather than reflecting the integration of the group, it incorporates a measure of the need for integration or the state of group disintegration.

Being thus confounded, the interpretation of Table 12 is difficult and must remain ambiguous. There was almost twice as much integrative communication in the teleconference modes as in the face-to-face and, unlike the other analyses, the mediated/immediate integration ratio was about the same for both teleconference modes. When viewed in the context of the other social emotional categories, it is difficult to interpret this category as a measure of group elan and, though tentative, we favour the interpretation based upon the confounding of communication types within a single category.

"We" (as a whole group) The extent to which the word 'we' and similar words or phrases, that clearly referred to the total group were used in the conferences, was an independent, low intensity measure of group integration.

Table 12: Positive Social Emotional--High Intensity Integration
(1) Mode by Week (2) Mode by Addressing

	Audio		Video		Face-to-Face	
	Words	Units	Words	Units	Words	Units
Conference Week 1	289	32	77	10	120	11
Conference Week 2	79	10	226	37	153	2
Conference Week 3	72	9	65	10	174	17
Total	440	51	368	57	447	30
% relative to face	(98%)	(170%)	(82%)	(190%)	-	-
% audio/video	(120%)	(89%)	-	-	-	-

Addressing: (over all weeks)	Words	(%)[a]	Units	Words	(%)	Units	Words	(%)	Units
Immediate Node	148	(33)	17	111	(32)	18	77	(23)	7
Mediated Node[b]	188	(45)	23	191	(54)	31	4	(3)	1
All Members	104	(22)	11	66	(14)	8	366	(74)	22
Total	440	(100)	51	368	(100)	57	447	(100)	30
Mediated/Immediate Integration Ratio	(3.9/1)		(1.4/1)	(1.7/1)		(1.7/1)	-		-

[a] Addressing percentages based upon communication units.

[b] The mediated node in the Face-to-Face mode is the group members on the other side of the conference table.

Table 13: "We" Index of Internode Integration Mode by Week

	Week	Audio f	Video f	Face-to-Face f
"We" Total Group	1	21	44	8
	2	18	30	9
	3	7	11	43
	Total	46	85	60
	% relative to face	77%	142%	-
	% audio/video	54%	-	-

Especially interesting were the comparisons between the teleconference modes, because of their identical spacial relationships. If, as has been often and informally suggested, the occurance of such words or phrases is purely locative, referring to the obvious physical separateness or the nodes, the indicators should occur about equally often in each mode. On the other hand, if these are unobtrusive measures of group integration, there should be differences.

The data supports the latter interpretation in that 'we' was used almost twice as often in the video groups as in the audio groups. It is also interesting to note that the use of 'we' in the face-to-face groups fell about half way between audio and video. This may mean that the video groups were better integrated than the face-to-face groups but one would not want to pursue this line of argumentation of the basis of only this evidence.

Social Emotional Uncertainty An earlier report of this study (Report #1), based upon post-session questionnaire data, provided evidence that those in the audio conferences felt more uncertain about the values, norms, roles and overall

definition of the situation than did those in the video conferences. This difference was significantly more acute within the context of the mediated group.

Based upon this evidence, it was naively expected that there would be more verbal expressions of uncertainty in audio than in video. (Because of the wording of the questionnaire items, self-reported data was not available for the face-to-face conferences.) However, just the opposite occured (Table 14). There was more expressions of uncertainty in video than in audio and more still in face-to-face.

Reflecting on this, it seems reasonable that, if uncertainty does exist more in audio as the respondents said it did, the most obvious method of resolving this is to express the uncertainty. It can be argued that the relative failure of the audio group to express their uncertainties resulted in the retention of the uncertainties. This interpretation is consistent with other findings suggesting the relative unwillingness of people in audio conferences to greatly disclose themselves. The fact that the differences between the video and the audio modes were not great also supports the testimony that the video medium produced less uncertainty. This argument is not overly compelling, however, since the visual face-to-face medium prompted the greatest number of uncertainty disclosures. One further interpretation will be introduced but not carried too far. A possible 'focusing' effect in video--concentration on the in-coming monitor--might have reduced the uncertainty in the video mode relative to face-to-face. There was other questionnaire evidence that suggested this in Report #1 but the possibility of a 'focusing' phenomenon and its impact needs further substantiating research.

Confirmation--Social Emotional Uncertainty An extreme form of disorientation has occured when there is a need to inquire if a group member or members are still part of the group. Expressions like "Have you fallen asleep (over there)?" "Are you still with us" and the like were coded as need for 'confirmation' of the existence of the group as a group. Since these inquiries reflect extreme conditions, one would not expect them to occur on a regular basis in any group. However, in audio the inability to see

Table 14 : Social Emotional Uncertainty--Requests Help, Understanding, Agreement
(1) Mode by Week (2) Mode by Addressing

Uncertainty Week	Audio		Video		Face-to-Face	
	Words	Units	Words	Units	Words	Units
1	1043	55	646	24	1244	42
2	782	53	1513	83	2433	56
3	731	17	700	28	1812	69
Total	2556	125	2859	135	5489	167
% relative to face	(47%)	(75%)	(52%)	(81%)	-	-
% audio/video	(89%)	(93%)	-	-	-	-
Addressing: (over all weeks)	Words (%)[a]	Units	Words (%)	Units	Words (%)	Units
Immediate Node	494 (9)	11	378 (19)	25	134 (7)	12
Mediated Node[b]	788 (45)	56	815 (33)	45	672 (13)	21
All Group Members	1274 (46)	58	1666 (48)	65	4683 (80)	134
Total	2556 (100)	125	2859 (100)	135	5489 (100)	167
Mediated/Immediate Uncertainty Ratio	(1.6/1)	(5/1)	(1.7/1)	(1.8/1)	-	-

[a] Addressing percentages based upon communication units.

[b] The mediated node in the Face-to-Face mode is the group members on the other side of the conference table.

Table 15 : Social Emotional Uncertainty--Requests Confirmation
(1) Mode by Week (2) Mode by Addressing

Requests Confirmation Week	Audio		Video		Face-to-Face	
	Words	Units	Words	Units	Words	Units
1	79	8	9	1	0	0
2	0	0	15	2	12	2
3	111	11	0	0	28	3
Total	190	19	24	3	40	5
% relative to face	(475%)	(380%)	(60%)	(60%)	-	-
% audio/video	(792%)	(633%)	-	-	-	-

Addressing: (over all weeks)	Words	(%)[a]	Units	Words	(%)	Units	Words	(%)	Units
Immediate Node	16	(16)	3	0	(0)	0	0	(0)	0
Mediated Node[b]	167	(79)	15	15	(67)	2	1	(20)	1
All Group Members	7	(5)	1	9	(33)	1	39	(80)	4
Total	190	(100)	19	24	(100)	3	40	(100)	5

[a] Addressing percentages based upon communication units.

[b] The mediated node in the Face-to-Face mode is the group members on the other side of the conference table.

the people at the other node in the system and the total reliance on verbal information of their continued 'existence' as a member of the group, suggested that there would be more 'confirmation' requests in audio.

This notion was supported by the data (Table 15). While there was a sprinkling of such remarks in video and face-to-face, they occurred fairly often in audio, 19 instances compared with three in video and five in face-to-face. Not surprisingly, 15 of the 19 questions were directed to the other node.

NEGATIVE SOCIAL EMOTIONAL

Low Intensity Disagreement All communication that expressed mild disagreement, reservation, or doubt was coded in this category. In 'normal' deliberations requiring that alternatives be weighted and sifted in the decision-making process, 'disagreement' is a necessary factor in the critical evaluation of the various ideas and suggestions that are advanced.

Whether the calculations were based upon 'words' or 'frequency', there was much more disagreement among group members in video than either the audio or face-to-face conditions, and more in face-to-face than in audio (Table 16). This should not necessarily suggest that video is a more argumentative medium. Since audio devoted the least time to the task, mapped a less complex task environment, and made the fewest and least complex recommendations, it seems reasonable that this mode would have the fewest number of ideas with which there could be disagreement. The relatively richer task environment in the other modes would be expected to provide more areas of disagreement.

The difference between video and face-to-face is less easily explained, although the magnitude of the difference is less than the differences between either mode and the audio condition, especially when the calculations are based upon 'words'. This may be attributable to the fact that video made more recommendations than face-to-face, if it can be assumed that the 'recommendation' task area provides the greatest potential for disagreement.

In comparing audio and video in terms of the addressing of remarks of 'disagreement', the frequency of disagreement was balanced between the two nodes in video, but the audio groups rarely disagreed with members of their own node. The mediated/immediate node disagreement ratio was 1.8 to 1 in

Table 16 : Negative Social Emotional--Low Intensity Disagreement
(1) Mode by Week (2) Mode by Addressing

Disagreement Week	Audio		Video		Face-to-Face	
	Words	Units	Words	Units	Words	Units
1	998	68	1446	83	600	30
2	480	46	1132	74	832	32
3	120	17	549	38	1144	75
Total	1598	131	3127	195	2576	137
% relative to face	(62%)	(96%)	(121%)	(142%)	-	-
% audio/video	(51%)	(67%)	-	-	-	-

Addressing: (over all weeks)	Words	(%)[a]	Units	Words	(%)	Units	Words	(%)	Units
Immediate Node	259	(20)	26	1425	(45)	88	387	(20)	28
Mediated Node[b]	960	(64)	84	1241	(48)	93	890	(32)	43
All Group Members	379	(16)	21	461	(7)	14	1299	(48)	66
Total	1598	(100)	131	3127	(100)	195	2516	(100)	137
Mediated/Immediate Disagreement Ratio	(3.7/1)		(3.2/1)	(.9/1)		(1.1/1)	(2.3/1)		(1.5/1)

[a] Addressing percentages based upon communication units.

[b] The mediated node in the Face-to-Face mode is the group members on the other side of the conference table.

video and 5 to 1 in audio. In face-to-face the ratio was 1.85 to 1 but this was based upon only 20% of the 'disagreement' units as the other 80% were addressed to the whole group rather than to a specific person in the face-to-face condition.

The inability to disagree with members of one's own node, in audio, suggests that task outcomes in this medium may be more a function of the spatial relationships between members than the instrinsic nature of the task.

High Intensity Disintegration (Hostility) While audio had the least amount of low intensity 'disagreement', this mode produced the greatest amount of high intensity group disintegrative communication (Table 17). The video conferences produced by far the least. There was more hostility in the first week of the audio conferences than there was in all weeks of the video conferences! After the first week in audio the verbal hostility steadily decreased but this does not necessarily mean that the remarks of the first week were forgotten in the subsequent sessions. The pattern in face-to-face was reversed as hostility increased over the three sessions. One possible explanation for the face-to-face pattern is suggested by the fact, that in face-to-face much more than in the teleconferences, the first week was almost entirely given over to mapping the task environment i.e., in face-to-face the groups 'got down to work' sooner, which possibly reduced the incidents of emotional confrontation.

The audio groups showed almost no hostility toward members of their own node and by far the most of their hostility was addressed directly to members of the mediated node. In video, the hostility was as likely to be directed at members of one's own node as to members of the mediated node. Mediated/immediate node hostility ratios were about 6 to 1 in audio, 1.4 to 1 in video and 2 to 1 in face-to-face (recall that the expected ratio, by chance, is 1.5 to 1).

Deflation of Task The audio groups made negative remarks about the group task or suggested nontask activities about three times as often as did those in face-to-face and about twice as often as did video conferees (Table 18). The addressing patterns were similar in all modes.

This can be interpreted in a number of ways, all of which seem reasonable and are complimentary. The relative simplicity with which the audio groups mapped a task environment and their lower level of task accomplishment may have created a less interesting task environment than in the

Table 17: Negative Social Emotional--High Intensity Disintegration (Hostility)
(1) Mode by Week (2) Mode by Addressing

HOSTILITY		Audio		Video		Face-to-Face	
		Words	Units	Words	Units	Words	Units
(1) Week	1	773	55	165	14	176	14
	2	324	13	231	34	445	24
	3	124	9	29	5	405	43
Total		1221	77	425	53	1026	81
% relative to face		(119%)	(95%)	(41%)	(65%)	-	-
% audio/video		(287%)	(145%)	-	-	-	-
(2) Addressing (over all weeks)		(%)[a]		(%)		(%)	
Immediate Node		68 (12)	9	141 (34)	18	114 (16)	13
Mediated Node[b]		941 (68)	52	199 (49)	26	280 (32)	26
All Group Members		212 (20)	16	80 (17)	9	632 (52)	42
Total		1221 (100)	77	425 (100)	53	1026 (100)	81
Mediated/Immediate Hostility Ratio		(13.8/1)	(5.8/1)	(1.4/1)	(1.4/1)	(2.5/1)	(2.0/1)

[a] Addressing percentages based upon communication units.

[b] The Mediated node in the Face-to-Face mode is the group members on the other side of the conference table.

Table 18: Negative Social Emotional--Deflation of Task
(1) Mode by Week (2) Mode by Addressing

Task Deflation	Audio		Video		Face-to-Face	
Week	Words	Units	Words	Units	Words	Units
1	35	5	0	0	35	1
2	125	12	76	15	14	1
3	122	13	22	3	37	7
Total	282	30	98	18	86	9
% relative to face	(328%)	(333%)	(114%)	(200%)	-	-
% audio/video	(287%)	(167%)	-	-	-	-

Addressing: (over all weeks)	Words	(%)[a]	Units	Words	(%)	Units	Words	(%)	Units
Immediate Node	32	(17)	5	19	(17)	3	3	(11)	1
Mediated Node[b]	90	(33)	10	27	(33)	6	11	(22)	2
All Group Members	160	(50)	15	52	(50)	9	72	(67)	6
Total	282	(100)	30	98	(100)	18	86	(100)	9

[a] Addressing percentages based upon communication units.

[b] The mediated node in the Face-to-Face mode is the group members on the other side of the conference table.

other two modes. If this was the case, some nontask alternative would have been more attractive. Also, the high level of internode disagreement and hostility that existed may have resulted in audio conferees searching for less antagonistic discussion areas. This seems reasonable in light of the fact that audio groups actually did have a higher proportion of nontask discussions than the other groups. The nontask tangents in audio would also likely result in some resentment by those members with a greater task orientation.

"We/You" Node Distinctions This analysis is a companion to the earlier "we" (as a whole group) attempts to determine if the use of such words represented a measure of group integration, or merely referred to the obvious physical separateness of the teleconference nodes.

The evidence provided in Table 19 is consistent with that of Table 13 in supporting the group integration proposition. The audio groups made 25% more references to 'we/you' distinctions than did the video groups. That these distinctions were rarely made, and only in the first week, in face-to-face was to be expected. Since three people were from one tutorial group in the Communication Program and three from another, the we/you differentiations in the first week were between tutorial groups.

For all modes, 'we/you' distinctions could refer to (a) tutorial groups (b) nodes, or (c) an out-of-awareness feeling of oneness or separateness of the node subgroups. The evidence suggests that the terms were used in all three ways but the magnitude of the differences in frequencies between audio and video can only be interpreted as support for the position that video group members were better integrated than were the audio group members.

Table 19: "We/You" Index of Internode Separateness Mode by Week

	Week	Audio f	Video f	Face-to-Face f
"We" immediate node and "You" mediated node	1	85	47	7
	2	61	80	1
	3	26	9	0
	Total	172	136	8
	% audio/video	126%	-	-

CONCLUDING REMARKS

The data base from which the preceding analyses were derived was extremely rich and the ways that the data could be looked at and the modal comparisons that could have been made are almost endless. The analyses that were done are those that seemed to be most relevant for answering questions about the impact of mediated technologies on group performances. However, some analyses that could have been run and should have been run have probably been omitted. For those who might reasonably question the omissions, we can only offer the sheer quantity of analytic possibilities as an excuse or apology.

Also, in discussing the findings we attempted to bring into prominence only those differences that appeared sufficiently large and meaningful as to virtually rule out chance fluctuations in the interaction in the three modes as an explanation. Again, it is likely that others will make connections between the data presented and provide interpretations that we have overlooked.

CHAPTER IV

DISCUSSION

It would be difficult, in light of the present findings, to retain any notions that communication medium does not have profound affects on a wide range of group communication performances. When group interaction was carefully observed and documented with considerable precision, and compared across communication media, two generalizations become apparent. First, a variety of information becomes available that would be impossible to obtain by simply asking the participants themselves to either understand or recall "what happened?". Secondly, where comparisons between subjective and nonsubjective data are possible, and each purports to be providing information on the same phenomenon, the magnitude of the differences between media is likely to be greater and more understandable when nonsubjective measures are employed.

Consider some examples of the second generalization. In Report #1, data were presented on participants' evaluations of the conference sessions over the three media, based upon their attitudes as measured by a series of 5-point semantic differential scales. Compared with video conferences, for example, the audio medium was judged less useful, less productive and less probing. All differences were statistically significant but the magnitude of the differences, since they were constrained by the scale width, were only .48, .25 and .30 scale units respectively. Statistical significance notwithstanding, what does one-half, one-quarter and one-third of a scale mean? How much more productivity does one-quarter of a scale unit represent? One could be perhaps forgiven for arguing that, while the differences are statistically significant, they are not 'large' and probably not socially significant. What constitutes socially meaningful differences is a value judgment which, while it can be debated, cannot usually be resolved.

However, when usefulness, productivity and superficiality of conference disucssions are operationalized in terms of the degree and complexity with which a task environment is mapped, the frequency and complexity with which task objectives are realized, and the extent and complexity with which decisions are refined, and uniformly applied to the ongoing communication in

both media, the differences that emerged were such that it is no longer possible to argue social insignificance. The task environment mapped over the video medium was much more extensive than over the audio-only medium, the simple/complex ratio of statements slightly more than half, nearly twice as many recommendations were made, and proportionately more of them were multidimensional recommendations and the audio medium made only about half as many post-recommendation refinements. That actual differences of these magnitudes were perceived as differences of less than half a scale unit by the participants themselves, underlines the problems associated with attempting to comprehend the social significance of scale differences.

One further example of this problem will be mentioned. Again in Report #1, indices of 'perceived acceptance' by members of the immediate and the mediated nodes were presented for conferences on both media, based upon self-reported sociometric measures. There was no difference in perceived acceptance by members of one's own node for the two media, but those in audio reported that the 'other' node disagreed with them more than did those using the video medium. The difference between the indices was .36 scale units on a 4-point scale and was statistically significant at p less than .001. It has been argued that a difference of .38 is not very large, that the perceived acceptance levels by the mediated node for both medium are about the same, and despite the statistical significance which is based upon a large sample, the interpretation of media difference is 'spurious' (Young, 1974). We, of course, would argue that the interpretation is not spurious, but the opposing opinions cannot be resolved on the basis of the index that was constructed.

Turning to the present data, however, the interpretation is not questionable. Over the audio medium, the six groups made 960 statements of low emotional disagreement with members of the 'other' node and only 259 with the speaker's 'own' node, a ratio of 3.7/1; over the six groups in video, 1241 such statements were directed at the 'other' node and 1425 at one's 'own' node, a ratio of .87/1. High emotional intensity statements of disagreement and hostility over the audio medium were, 941 addressed to the 'other' node and 68 to one's 'own' node, a ratio of 13.8/1; over video, 199 to the 'other' node

and 141 to one's 'own' node, a ratio of 1.41/1. If our interpretation of the difference was 'spurious', the people in the conferences were, indeed, not very atuned to the disagreement patterns that existed! If anything, the self-reported difference between media was an understatement of the patterns of disagreement.

At this point, it might be well to offer some comments on what we see as a growing misconception in the 'teleconference' research literature. In the past six or seven years, since teleconferencing behavioural research began in some earnest, an array of studies have reported results that some have considered to be contradictory, or at least nonsupportive. In addition to our own research, recent studies by Ryan and Craig (1975) and B.C. Tel (1974) have consistently reported significance affects on behaviour, attributable to the communication medium. Nondifferences have, by and large, been the exception. Other studies by Heilbronn and Libby (1973) and notably, a large number of studies conducted by the Communication Studies Group in London, have, with some exceptions, tended to report very little media affects on behaviours.

Inevitable methodological and procedural differences in the studies is not a very compelling explanation for the differences in results. A more reasonable explanation can be found by considering the fact that those studies that generally report media differences involve teleconference groups of more than two people, and those that generally report nondifferences in media affects have almost always involved teleconference dyads. Twenty-five years of small group research is a testimony to the fact that the two communication phenomena are very different, and comparing phenomena that are not comparable can only lead to different results, not inconsistent results. Rather than attempting to reconcile the 'differences', these should be seen as mounting evidence, if such is necessary, that group and dyadic interaction, regardless of the medium, do not generalize very well to each other.

A variety of the findings in the study provide evidence that permit speculation as to the reasons for the relatively low level of task accomplishment and high level of internodal antagonism between groups using the audio medium. To begin with, recognition that the task was not being accomplished might very

well in itself create hostility toward the unseen group as the participants look for scapegoats other than themselves. If this is happening, it probably is happening out of awareness rather than with deliberate intent.

Also, there are a variety of indications that audio conferees were less willing to disclose as much about themselves to the mediated node as those in the video conferences. First, those in audio spoke, on the average, for shorter periods than those using the visual media, and thus, at any given time, were likely to provide fewer cues about themselves and about what they thought.

Secondly, in mapping the task area, they were much more likely to ask someone else, usually those in the mediated node, for background information than they were to provide such information themselves. Perhaps, as in all media conditions, since they did not initially know the others, and in audio could not have the advantage of any visual cues, they initially attributed an unwarranted credibility to the people at the 'other' node. In any case, the disproportionate requesting/providing ratio of mapping information most probably contributed to the relative inadequacies of the task environment that was mapped in the audio condition.

Thirdly, the relative inability of the audio groups to translate their discussion of the problem (mapping) into recommendations (action selections) suggests, that while they were willing to discuss the situation, they were less willing than the other groups to present recommendations for group consideration. The argument is based upon the assumption that statements like, "this is what I believe should be done....." reveal more about the speaker than statements that merely provide more information that might be relevant to an action selection.

Also, those in the audio medium were much less willing to reveal the uncertainties they had about the other people and the task situation, which suggests that they did not wish to appear confused. Over time, it is possible that the accumulation of unresolved uncertainty became manifest in remarks of hostility directed at the source of their uncertainties--the members of the mediated node. The proposition of a mutual lack of self disclosure to members of the other node is also supported by the high incidence of need for confirmation that members of the other node still

'existed'. It appears fairly obvious that one or more members of the 'other' node were providing so little information at certain periods, that those at the other end were prompted to inquire if the person or people were "still there".

There is a variety of anecdotal evidence that some people feel, with a sense of satisfaction, that one advantage of audio conferencing is that "the meeting took less time". Certainly this would be desirable for many meetings, and if, for whatever reason, a major goal of a meeting is to "get it over with", the audio medium appears to be preferable to either video or face-to-face conferencing. Although length of meeting was not a variable in this study, the groups did seem to feel that they could not reduce the session time--they were told that they had 45 minutes for each session but they were not told that they could not leave before the allotted time was up. However, much of the evidence from the study can be interpreted as suggesting that the audio medium groups would have held shorter sessions had they realized that this factor was within their control, e.g., a simpler, less interesting, task environment was generated, a lower level of task accomplishment, greater interpersonal hostility, more uncertainty, more nontask discussion and more frequent suggestions that the groups engage in nontask activity.

To summarize the discussion of the audio-only medium of group communication, the findings of Report #1 and especially the findings reported here, provide little in the way of encouragement for audio conferencing as a desirable alternative when either face-to-face or video conferences are available or feasible. The audio medium appears to seriously affect group performance for meetings held for the purpose of gathering information, weighing alternatives and making decisions..

In some respects, the comparisons of performances in video and face-to-face conferences provide the most interesting findings in the study. It is a 'common sense' presumption that, because the channel capacity of video is somewhat less than the capacity of face-to-face communication, video conferencing can at best approach the levels of

desirability of face-to-face on a variety of behavioural considerations. The television medium, however, appeared to be 'superior' to varying degrees on a number of performance criteria that were investigated.

For instance, although the differences were not great, video groups did achieve a slightly higher level of task accomplishment. This is consistent with the self-reported evidence from Report #1 where the majority of conference evaluation scale ratings were higher, but not usually significantly higher, than face-to-face. (Although the content analysis of the meetings provides validating support for the self-reported differences in conference evaluations, it must be noted that other research findings indicate that the nonsignificant trend favours face-to-face over video.)

More interesting than the 'level of accomplishment' data, however, were the observations of the interpersonal relationships in the two visual media. Over television, people verbalized more low intensity disagreement than in the face-to-face situation. At the same time, there was far less highly emotional disagreement and hostility over television. This implies that over television, people expressed differences of opinion more often than in face-to-face without developing as high a level of antagonism or hostility. Furthermore, the disagreement and hostility in the video situation was not polarized between the conferences nodes. People were just as likely to disagree or be antagonistic toward members of their own node as they were to members of the mediated node. Returning to audio conferencing for a moment, disagreement and antagonism was overwhelmingly polarized between the nodes.

If this is indeed a characteristic of television conferencing, and not an artifact of the people in the study or the conference task, teleconferencing may be a very useful medium for such situations as bargaining and negotiation, as well as any other situation where groups come to the 'meeting' with clearly opposing positions, backgrounds and values. Perhaps television is a 'cooler' medium than face-to-face in both the common and McLuhanesque sense.

BIBLIOGRAPHY

Altman, J. "Aspects of the Criterion Problem in Small Group Research. 1 Behavioural Domain to be Studied". Acta Psychol., 1966a 25, pp. 101-131.

Bales, Robert F. Interaction Process Analysis. Cambridge: Addison-Wesley Press, Inc., 1951.

B.C. Tel. An Experiment in Conference T.V. Vancouver, 1974.

Berger, Joseph et. al. Types of Formalization in Small-Group Research. Boston: Houghton Mifflin, 1962.

Berlyne, D.E. Conflict, Arousal and Curiosity. New York: McGraw-Hill, 1960.

Bouchard, T.J. "A Comparison of Two Group Brainstorming Procedures". Journal of Applied Psychology, 1973.

Bouchard, T.J. "Personality, Problem-solving Procedure and Performance in Small Groups". Journal of Applied Psychology Monograph, 1969, 53, pp. 1-29.

Bouchard, T.J. "Training, Motivation, and Personality as Determinants of the Effectiveness of Brainstorming Groups and Individuals". Journal of Applied Psychology, 1972, 56, pp. 324-331.

Bouchard, T.J., and M. Hare. "Size, Performance and Potential in Brainstorming Groups". Journal of Applied Psychology, 1970, 54, pp. 51-55.

Campbell, J. "Individual Versus Group Problem-solving in an Industrial Sample". Journal of Applied Psychology, 1968, 52, pp. 203-210.

Casey-Stahmer, Anna E., and M. Dean Havron. Planning Research in Teleconference Systems. Ottawa: Department of Communications, July 2, 1973.

Champness, B.G. "Attitudes Towards Person-Person Communication Media". Communication Studies Group Report #E/72011/CH, Joint Unit for Planning Research. London: University College, 1972.

Christie, L.S. "Task Types and Requirements for Organization". (eds.) J.R. McClosky and J.M. Coppinger. Operations Research for Management, Vol. 2. Baltimore: The Johns Hopkins Press, 1956.

Collins, Barry E., and Harold Guetzkow. A Social Psychology of Group Processes for Decision-Making. New York: J. Wiley and Son, 1970.

Communications Studies Group. Interim Report July 1971. London: CSG, July, 1971.

Duncanson, James P., and Arthur D. Williams. "Video Conferencing: Reactions of Users". Human Factors, Fall, 1973.

Dunnette, M.D., et. al. "The Effectiveness of Group Participation on Brainstorming Effectiveness for Two Industrial Samples". Journal of Applied Psychology, 1963, 47, pp. 30-37.

Heilbronn, M. and Wm. J. Libby Jr. "Comparative Effects of Technological and Social Immediacy Upon Performance and Perceptions During a Two-Person Game". unpublished paper, Windsor, 1973.

Heinicke, C. and R.F. Bales. "Developmental Trends in the Structure of Small Groups". Sociometry, Vol. XVI, 1953, pp. 7-38.

Hoffman, L.R. "Group Problem Solving". (ed.) L. Berkowitz, Advances in Experimental Social Psychology, Vol. 2. New York: Academic Press, 1965, pp. 99-132.

Kelley, H.H., and J.W. Thibault. "Group Problem Solving". (eds.) A. Lindzey and E. Bronson. The Handbook of Social Psychology, (2nd. ed.). Mass.: Addison-Wesley, 1969.

Miller, James G. "Living Systems: Basic Concepts; Structure and Process: Cross-Level Hypotheses". Behavioural Science, 10, 1965, pp. 193-237, 337-79, 380-411.

McGrath, Joseph E., and Irwin Atlman. Small Group Research: A Synthesis and Critique of the Field, New York: Holt Rinehart and Winston, 1966.

Roby, T.B. Small Group Performance. Chicago: Rand McNally, 1968.

Roby, T.B. and J.T. Lanzetta. "Work Group Structures, Communications and Group Performance". Sociometry, 1956, 19, pp. 105-113.

Rotter, G.S., and S.M. Portugal. "Group and Individual Effects in Problem Solving". Journal of Applied Psychology, 1969, 53, pp. 338-341.

Ryan, Michael G., and James G. Craig. "The Influence of Teleconferencing Medium and Status on Attitudes Towards the Medium, Attitudes Towards the Discussion, and Mood". Ottawa: Communications Canada, 1975.

Schroeder, H.M., M.J. Driver and S. Streufert. Human Information Processing. New York: Holt, Rinehart and Winston, 1967.

Teleconference Canada Research Plan. Ottawa, Canada, Department of Communications. August, 1972. Prepared by the Social Planning and Programs Branch.

Watzlawick, P., J.H. Beavin and D.D. Jackson. Pragmatics of Human Communications. New York: Norton, 1967.

Weston, J.R. and C. Kristen. "Dimensions of Interpersonal Atmospher, Reciprocity, and Perceptual Accuracy in Mediated Groups", 18th International Congress of Applied Psychology, July, 1974.

Weston, J.R. and C. Kristen. Teleconferencing: A Comparison of Attitudes, Uncertainty and Interpersonal Atmospheres in Mediated and Face-to-Face Group Interaction. The Social Policy and Programs Branch, Department of Communications. Ottawa, Canada. December, 1973.

Young, Ian. Communications Studies Group. "Understanding the Other Person in Mediated Interactions". London: University College, Ref: E/74266YN. October, 1974.

APPENDIX A

TRANSCRIPT SAMPLES

What are your names?

1 I think we're supposed to communicate with you.

1 Where are you going?

5 To turn up the volume.

1 Oh.

4 Audio. Say something.

2 Hello.

4 Say it again.

2 Hello.

(no sound)

(mumbling)

6 Do you want to make out sort of a schedule of what we're saying?

Okay, ...

6 You know, like different.....

2 We'll start from the beginning of the week - Monday.we have lectures. What's wrong with the lectures?

1 Lots.

2 Lots. A lot of people say you come back bored, right? Why.

1 Because we are.

6 I think two hours is too long.

2 Okay, that's point number one. I'm going to write down points.

6 Okay, but if you're going to ....

2 But we don't have to write down points because.....

Okay, if two hours is too long, would 2 one-hour periods be better? Would you get as much. If you could last through one hour I'm sure .....

2 Do you think so, really?

6 Well this ... because the lectures are two hours, they write their lectures for two hours. But if they were one hour then they'd pack everything into one hour.

2 Yeah, okay. I find a lot of the time, the lectures that last for two hours are .... it would be very much better if you only had one hour to write it in.

6 Right.

2 Because it's tiring and people who are listening hear the same thing over and over again.

4 One hour all talking or movies or what?

3 The movies are great. It breaks the monotony.

6 Right.

3 The big thing about Architecture students is Monday morning we have something like 5 hours straight, ay? And that really helps to .....

4 (unclear)

3 Yeah.

6 How about two one hours then? Because you're going to have to have 4 hours a week one way or the other.

2 Yeah, then you start into the problem of rescheduling.

1 Yeah.

6 Start into the problem of what?

2 Rescheduling.

6 Oh yeah, but this is, I mean, for next year.

2 For next year.

6 You know, they'll schedule it in.

2 Well then you say one hour and then let's say you half of the time for lecture and the other half for a movie? They can't.... that's the problem some of the movies are so long that you have to have the extra time. So....

6 Well it would involve rescheduling .... they've got a....(unclear - poor sound)...

2 Yeah.

6 They've got every lecture covered about the content of each lecture. Well when next summer comes they'll just have to restructure. the whole thing. I mean gear it towards two one-hour lectures a week. And they can..... (unclear) move it into that. It's just that you start on Tuesday and continue on Thursday or whatever. Start on Monday, continue on Wednesday.

3 I wonder if it's set up that we have to have two hours of lectures and then two hours of discussion.

6 One hour lecture, 3 hour discussion?

3 Yeah or an hour and a half or two and a half.

6 No I mean....(unclear - sound)..... When you think of Journalism as a group you don't get anything out of the lecture.

3 No, not really. I just go to the lectures because.....

6 Yeah, right.

4 There's no tie between the lectures and the group. Do you find that?

6 Or else.....That's our fault. I think. No it's true. We don't.... I mean, I don't thin .....(unclear).. I mean, we just don't....

4 I mean in the lectures they just tell you... well they .. inform you the ways to communicate, and yet, it's a communications course and you don't really communicate in the lectures either. You just listen.... (unclear - sound)..... It's a waste.

3 Yeah, we're really just sitting there and they're supposed to tell us how we're supposed to be communicating. You know?

6 And it's a real farce, because we're not communicating. Because how can you communicate with 200 people?

3 Right. Well it's not a complete farce. It's useful ay? Like anything else, you need a little bit of theory to go along with the rest of it. Myself, I'd like to see a littke bit more of the type that we do in the groups.

4 Like are your groups organized? Like do you go in and there's somebody....

6 Oh very organized.

4 Like we go in and the guy... well what do you want to talk about today? or what do you want to do?

3 Yeah.

4 They should have something set up. I mean.....

2 No.....

3 No, we just sit in there and talk about whatever we want to talk about. That way everybody gets involved.

6 I think we all found it hard to adjust to at first, because when we were in high school everything was fed to us. When you're just given two hours to do what you want, you have no idea what you want to do. We found that.. I mean, I found that in our group at the beginning of the year . We were expecting our group leader ....(unclear- sound) to give us a schedule of what we were going to do. And I mean that's not his position, that's not what he's supposed to do. And we just had to adjust to it....(unclear), but we're getting along really well now. You know....

5 About the Architecture students taking the course. It's probably one of the bigger enrolment courses, so we get a chance to meet some of the other people in the school. And it's good in that respect. And similarly you get to meet some strange types. It's too bad everybody sits together. But at least the groups are almost constituted so that they don't get.... Well not all architects and not all journalists. The only one other thing... minor thing here is that in groups... Like the audio visual groups, within a larger group, they shouldn't be allowed to be composed of more than one architect. Because....

1 Yeah, that's good because we had a whole group of architects in one group and everyone of them knew about film.

5 Yeah. That's poor.

1 Yeah.

5 So that's a minor thing that could be .... But for architects being in the course. I don't think they detract from it and a lot of us wonder what it's about, but I find it very good.

3 I think as far as the Journalism students are concerned, I think Carleton hasn't been doing they're homework too well in making them understand what first year is about. Because they make a big thing about...

5 Yeah.

3 .. getting into the School of Journalism. And how your marks have to be so and so. And there's a ten to one ratio of applicants who are accepted and so on. So you think you're going into a big thing, whereas really your first year, you're just going in for arts.

1 Right.

3 And the second year where you're really going in for Journalism.

5 And it's not too hard to... The how in that case is not too difficult. Just explain at the beginning. And explain in the admission brochures or whatever the hell they are.

3 Yeah.

5 That's pretty simple.

2 (unclear)

3 Well you have to drill it home. They do make a few attempts here and there, but I think you have to drill it home a little bit more than they do.

1 That it is an introduction.

3 No, that it's not Journalism in first year. It isn't Journalism in the first year, at all, period. It's Arts or whatever.....

2 (unclear)

3 ... With kind of an interesting course in messing around with human communications. Which you can take even if you're not a Journalism student.

1 Yeah.

3 You know.

5 We're doing well for a change.

2 (mumbling)

4 Do you remember any other recommendations? We had about five or six.

5 Yeah.

2 Oh there was something abat having discussion groups right after the lectures.

1 Yeah, so the lecture was still fresh in your mind. Some way to get either the lectures smaller or the lectures shorter, so that we could get a discussion period in. Remember at the beginning of the year they used to have time for discussions and I don't know, now they stick either a half hour film at the end or else the lecture keeps going on until 11:30.

5 But really, from the standpoint of other people's time... Although some people have interesting theories and

3 ... summaries and things like that. Like in that last film. I find I get more from a film than I do from questions and answers.

2 Yeah, yeah.

5 And as has been said, and I think it's very good, Karen said this a number of times, if you go up there, they'll talk with you. Which is good. So you get the answers then. And if you're interested then your fine. But if you ask in the class and you take everybody else's time,

1 Yeah, that's true.

4 Yeah, like Patrick McFadden mentioned getting reprints of his three lectures. So, you know, I went in and got them, and uh... you know, we didn't talk for long about it, but we did a little bit, but if I wanted to we could have sat down and talked. Oh, well they're willing I think. Especially ... well they all are. I don't know if that's a how. I don't know if that's really what they're looking for.

1 Yeah, but then I think, well sometimes.... Well a lecture, like they give us . It would be good to have some interpretation, and not you just going in and talking to a lecturer. But I think like a group interpretation, because I'd like to hear what other people...

5 But .....

2 But there are other people in the course that you know that you can talk to.

1 Not really. Not people who go to the lectures.

2 Because I wouldn't want to have a discussion group right after the lecture.

1 I don't mean a discussion group. Not a structured discussion group. But either in our groups, or after the lecture. Because I'm usually interested in the questions people have to ask.

1 Don't you usually discuss it in your groups?

No. Well we do to a certain extent. But not many people go to the lectures. So..

1 ... so it's not worthwhile.

3 Sure a lot of people do, they just don't open their mouths. You ask, you ask...

1 I've done it. We've done it. Remember we've done it. I asked some questions about the lecture, and people just sit there and go duh....

2 Yeah, well a lot of people... It's not because they haven't been. It's just because they don't feel like answering the questions.

2 Yeah.

3 Because a lot of those kids do go. I was surprised that some of them did go because they were so apathetic, but a lot of those kids do go to the lectures. There's very few people who don't go to at least every other week or ...

2 Did you go on Tuesday?

3 Yeah I did. First time since September. Ha, ha.

1 Holy Toledo. I haven't been for three weeks.

4 Well I have a question. Well, if you're going to university. Well obviously, you know, you want to go. So why don't you go to lectures? I mean even if they're not so good. I mean you're paying for them. It's not like high school where it's compulsory.

1 Right, okay. But if you have six hours staight of classes on Monday, sometimes it's nice to take a break. But still, I don't know, I've just found that Patrick McFadden's lectures I didn't like. So I just quit going to his lectures.

4 Yeah, but maybe he has something to say. Didn't you.....

Appendix B

Coding Categories

Unidimensional Task Content

Dimension 1 — Assignments and projects

1-audio video project
2-graphics project
3-research project
4-writing project
5-reading assignments
6-project philosophy in general
7-type and organization of project
9-other

Dimension 2 — Equipment and Workshops

1-what is taught
2-what should be taught
3-who should instruct
4-coordination of workshops
5-availability and use of equipment
9-other

Dimension 3 — Testing, Grading and other Feedback

1-criteria for evaluation
2-attendance considerations
3-grading improvement
4-verbal feedback
5-written feedback
6-who should grade
9-other

Dimension 4 — Audio-Visual Supplements

1-philosophy of film and video instruction
2-selection of film/video material
3-quality of film/video material
9-other

Appendix B (cont.)

Dimension 5 Tutorial groups

1-usage of tutorial time
2-role of tutorial leader
3-selection/training of tutorial leaders
4-tutorial size
5-assignment of students to tutorial
6-time and length of tutorials
7-freedom/structure/direction in tutorials
8-student contributions to tutorials
9-other

Dimension 6 Lectures

1-who should teach
2-what should be taught
3-structure of lectures
4-quality of present lectures
5-integration of lectures within a lecturer
6-integration between lecturers
7-time and length of lectures
8-size of lecture halls
9-other

Dimension 7 Overall course philosophy

1-course only for journalism majors
2-course for all majors
3-practical/theoretical orientation
4-structure/flexibility questions
9-other

Multidimensional Task Content

1-any combination of categories across Dimenions 1-7 that are integrated in a communication unit

Nontask Dimensions

Technological Aspects

1-visual
2-audio
3-special
9-other

Other

1-group discussion aspects
2-people, places and events unrelated to the task content dimensions
9-other

Appendix B (cont.)

Task/Group Structure

1-requests task direction
2-provides task direction
3-requests role, behaviour direction
4-provides role behaviour direction

Task Environment

Mapping

1-requests opinions, experiences feelings, wishes, evaluations, (not task recommendations or expansions)
2-provides opinions, background experiences, feelings, wishes, evaluations

Action Selection

1-makes explicit recommendation

Action Selection Adjustment

1-requests or provides elaboration, expansion, refinement or other changes in a recommendation

Interpersonal Environment (applies to all units)
Social Emotional

Positive
(1) Low intensity agreement

1-agrees, accepts, concurs, understands or shows other form of satisfaction

(2) High intensity integration

1-shows solidarity, raises individual or group status, gives help/reward/strong agreement, attempts to sooth hostility

(3) "We"

1-reference to the notion of "we" as a whole group (us, etc.)

Negative
(1) Low intensity disagreement

1-disagrees (mildly), doubts, "not sure", "don't think so"

Appendix B (cont.)

(2) High Intensity Disintegration

1-shows antagonism or other hostility, disagrees violently, deflates other's status, attacks or defends on a personal level

(3) Deflation of Task

1-overtly deflates the conference task, suggests nontask activities, stopping early, going to lunch or coffee, playing nontask games, etc.

(4) "We/You"

1-references to 'we', 'us', 'our side', 'over here', 'at this end', as opposed to 'we' meaning the whole group
2-references to 'you', 'over there', 'your group' as opposed to 'you' referring to a single person

Uncertainty

1-asks for help, understanding, clarification, cooperation, orientation
2-requests confirmation of the group

Neutral

(not coded)

Addressing

1-6 a specific person (as per transcript)
7-other node
9-own node
9-whole group or can't tell

Other codes

Previous speaker (1 to 6)
Minute of conference (1to 45)
Sequence number of communication unit (1 to 999)
Length of communication unit in words (actual No. of words)

WESTON, J.R.
Teleconferencing: a comparison of group performance profiles in mediated and face-to-face interaction ...